Paducah Site

Annual Site Environmental Report for Calendar Year 2012

Fractions and Multiples of Units

Multiple	Decimal Equivalent	Prefix	Symbol	Engineering Format
10^6	1,000,000	mega-	M	E+06
10^3	1,000	kilo-	k	E+03
10^2	100	hecto-	h	E+02
10	10	deka-	da	E+01
10^{-1}	0.1	deci-	d	E-01
10^{-2}	0.01	centi-	c	E-02
10^{-3}	0.001	milli-	m	E-03
10^{-6}	0.000001	micro-	µ	E-06
10^{-9}	0.000000001	nano-	n	E-09
10^{-12}	0.000000000001	pico-	P	E-12
10^{-15}	0.000000000000001	femto-	F	E-15
10^{-18}	0.000000000000000001	atto-	a	E-18

This report is intended to fulfill the requirements of U. S. Department of Energy Order 231.1A.[1] The data and information contained in this report were collected in accordance with the Paducah Site Environmental Monitoring Plan (LATA Kentucky 2011; LATA Kentucky 2012a) approved by DOE. This report is not intended to provide the results of all sampling conducted at the Paducah Site. Additional data collected for other site purposes, such as environmental restoration, remedial investigation reports, and waste management characterization sampling, are presented in other documents that have been prepared in accordance with applicable DOE guidance and/or federal or state laws.

[1] DOE Order 231.1B replaced Order 231.1A on June 27, 2011, and will be implemented in 2013 under LATA Kentucky contract DE-AC30-10CC40020.

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Paducah Site
Annual Site Environmental Report
for Calendar Year 2012

June 2014

Prepared for the
U.S. DEPARTMENT OF ENERGY
Office of Environmental Management

Prepared by
LATA ENVIRONMENTAL SERVICES OF KENTUCKY, LLC
managing the
Environmental Remediation Activities at the
Paducah Gaseous Diffusion Plant
under contract DE-AC30-10CC40020

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Acronyms and Abbreviations

ACO	Administrative Consent Order
AEC	Atomic Energy Commission
AFV	alternative fuel vehicle
AIP	Agreement in Principle
ALARA	as low as reasonably achievable
AM	action memorandum
AO	Agreed Order
ARRA	American Recovery and Reinvestment Act
ASER	Annual Site Environmental Report
ASTM	American Society for Testing and Materials
BGOU	Burial Grounds Operable Unit
BHHRA	Baseline Human Health Risk Assessment
BWCS	B&W Conversion Services, LLC
CAA	Clean Air Act
CAB	Paducah Citizens Advisory Board
CEDE	committed effective dose equivalent
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
CSOU	Comprehensive Site Operable Unit
CWA	Clean Water Act
CX	categorical exclusion
CY	calendar year
D&D	decontamination and decommissioning
DCG	derived concentration guide
DCS	derived concentration technical standard
DNAPL	dense nonaqueous-phase liquid
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOECAP	U.S. Department of Energy Consolidated Audit Program
DQO	data quality objective
EA	environmental assessment
EDD	electronic data deliverable
EIC	Environmental Information Center
EIS	environmental impact statement
EISA	Energy Independence and Security Act
EM	environmental management
EMP	Environmental Monitoring Plan
EMS	Environmental Management System
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
ERH	electrical resistance heating
FFA	Federal Facility Agreement
FFC Act	Federal Facilities Compliance Act
FFCA	Federal Facilities Compliance Agreement
FR	*Federal Register*
FFS	focused feasibility study
FS	feasibility study

FY	fiscal year
GDP	gaseous diffusion plant
GHG	greenhouse gas
GP	guiding principle
GWOU	Groundwater Operable Unit
HAP	hazardous air pollutant
HEPA	high-efficiency particulate air
HPSB	high performance and sustainable buildings
ILA	industrial, landscaping, and agricultural
IRA	interim remedial action
ISMS	Integrated Safety Management System
ISO	International Organization for Standardization
KAR	*Kentucky Administrative Regulations*
KCHFS	Kentucky Cabinet for Health and Family Services
KDAQ	Kentucky Division for Air Quality
KDENF	Kentucky Division of Enforcement
KDEP	Kentucky Department for Environmental Protection
KDOW	Kentucky Division of Water
KDWM	Kentucky Division of Waste Management
KPDES	Kentucky Pollutant Discharge Elimination System
LATA Kentucky	LATA Environmental Services of Kentucky, LLC
LLW	low-level radioactive waste
LPAF	Liquid Pollution Abatement Facility
LRGA	Lower Regional Gravel Aquifer
LUC	land use control
MCL	maximum contaminant level
MLLW	mixed low-level waste
MW	monitoring well
N/A	not applicable
ND	not detected
NEPA	National Environmental Policy Act
NEPCS	Northeast Plume Containment System
NESHAP	National Emission Standards for Hazardous Air Pollutants
NFA	no further action
NOV	Notice of Violation
NPL	National Priorities List
NR	not reported/collected
NRHP	National Register of Historic Places
NSDD	North-South Diversion Ditch
NWPGS	Northwest Plume Groundwater System
OREIS	Oak Ridge Environmental Information System
ORISE	Oak Ridge Institute for Science and Education
OU	operable unit
PEMS	Project Environmental Measurement System
PGDP	Paducah Gaseous Diffusion Plant
PPPO	Portsmouth/Paducah Project Office
PPTRS	Pollution Prevention Tracking and Reporting System
PUE	power usage effectiveness
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act

RGA	Regional Gravel Aquifer
RI	remedial investigation
ROD	record of decision
SARA	Superfund Amendments and Reauthorization Act
SE	site evaluation
SERA	Screening Ecological Risk Assessment
SI	site investigation
SMP	Site Management Plan
SOW	statement of work
SSP	Site Sustainability Plan
SST	Swift & Staley Team
STP	Site Treatment Plan
SWMU	solid waste management unit
SWOU	Surface Water Operable Unit
TLD	thermoluminescent dosimeter
TSCA	Toxic Substances Control Act
TSDF	treatment, storage, and disposal facility
TSS	total suspended solids
TVA	Tennessee Valley Authority
UCRS	Upper Continental Recharge System
UDS	Uranium Disposition Services, LLC
UE	uranium enrichment
URGA	Upper Regional Gravel Aquifer
USEC	United States Enrichment Corporation
UST	underground storage tank
VOC	volatile organic compound
WITS	Waste Information Tracking System
WKWMA	West Kentucky Wildlife Management Area
WM/PP	waste minimization/pollution prevention
WMP	Watershed Monitoring Plan

Request for Comments

The U.S. Department of Energy (DOE) requires an annual site environmental report from each of the sites operating under its authority. This report presents the results from the various environmental monitoring programs and activities carried out during the year. This *Paducah Site Annual Site Environmental Report for Calendar Year 2012* was prepared to fulfill DOE requirements. This report is a public document that is distributed to government regulators, businesses, special interest groups, and members of the public.

This report is based on thousands of environmental samples collected at or near the Paducah Site. Significant efforts were made to provide the data collected and details of the site environmental management programs in a clear and concise manner. The editors of this report encourage comments in order to better address the needs of our readers in future site environmental reports. Please send comments to the following address:

U.S. Department of Energy
Portsmouth/Paducah Project Office
1017 Majestic Drive, Suite 200
Lexington, Kentucky 40513

EXECUTIVE SUMMARY

The U.S. Department of Energy (DOE) manages work at the Paducah Site to comply with and adhere to all applicable laws, regulations, and site-specific regulatory permits. DOE continues to implement projects in a manner that protects site personnel, the environment, and Paducah Site neighbors and strives to maintain full compliance with all current environmental regulations.

Annually, DOE implements programs to measure impacts of its operations on the environment or the public. Surveillance under these programs includes analyses of surface water, groundwater, sediment, ambient air, and direct radiation. In calendar year (CY) 2012, surface water analysis results show a downward trend in contaminants at locations impacted by site operations. Groundwater analysis results indicate that the trichloroethene (TCE) plume is decreasing in size near source zones (see Chapter 6). Sediment analysis results show an overall downward trending, and ambient air monitoring results continue to be below permitted limits. In 2012, DOE expanded access to certain areas at the Paducah Site to support recreational use of DOE-owned property outside the fenced area of the site. The expanded access resulted in the ability of members of the public to come into closer proximity to cylinder yards than had been possible before. The direct radiation analysis to evaluate potential radiological exposure to an individual member of the public took into account the increased public access. Based on this analysis, the potential radiological exposure to an individual member of the public in CY 2012 is slightly higher than in previous years. However, the increase is not a cause for concern, as the potential exposure was less than 2% of the allowable DOE annual dose limit.

DOE has implemented measures to reduce contamination throughout the Paducah Gaseous Diffusion Plant (PGDP). Highlights of accomplishments through 2012 include the following: removed approximately 160 gal of TCE from contaminant source areas at Paducah in 2012, with a cumulative amount of approximately 6,000 gal removed since initiation of source action removal actions; demolished six facilities in 2012 that no longer were necessary to fulfill a site mission, with a cumulative number of thirty facilities demolished through 2012; DOE's conversion facility reached full operational status in September 2011. During 2012, DOE converted approximately 4,517 metric tons of depleted uranium hexafluoride (DUF_6) to a more stable oxide and aqueous hydrogen fluoride. Additionally, during fiscal year (FY) 2012, the Paducah Site recycled approximately 45 metric tons (99,000 lb) of materials.

The 2012 Annual Site Environmental Report (ASER) for PGDP has been prepared in accordance with DOE Order 231.1A, *Environment, Safety and Health Reporting of the U.S. Department of Energy*.[2] The report is prepared to inform the public, regulators, stakeholders, and other interested parties of PGDP environmental performance for the 2012 CY. The ASER summarizes the compliance status with all applicable federal, state, and local regulations; summarizes results of environmental monitoring; discusses potential radiation doses to the public residing in the vicinity of the PGDP site; and describes quality assurance (QA) methods used to ensure confidence in monitoring data.

Appendix A provides an overview discussion on radiation. Appendix B presents radionuclide and chemical nomenclature. The purpose of Appendices A and B is to provide a general understanding of

[2] DOE Order 231.1B replaced Order 231.1A on June 27, 2011, and will be implemented in 2013 under LATA Kentucky contract DE-AC30-10CC40020.

radiation and chemistry as they pertain to the 2012 ASER. Appendix C supplements the ASER and provides monitoring results in table form of the radiological effluent data, the radiological environmental surveillance data, the nonradiological effluent data, and the nonradiological environmental surveillance data. Appendix C is intended primarily for internal PGDP users, regulators, and other technically oriented stakeholders. Brief summaries of the data contained in Appendix C also are included in the main text of this report.

The current mission of DOE at the PGDP site includes two major programs: (1) Environmental Management (EM) and (2) the Uranium Program. DOE maintains responsibility for the environmental restoration of the PGDP site and conducts environmental monitoring, waste disposition, and decontamination and decommissioning (D&D) of legacy buildings under the EM Program. These programs are designed to minimize or eliminate the possible health and environmental hazards associated with past operations conducted at PGDP or potential uncontrolled releases of hazardous substances from contaminated structures. The major mission of the Uranium Program is to maintain safe, compliant storage of the DOE DUF_6 inventory until final disposition and to manage the facilities and grounds not leased to the United States Enrichment Corporation (USEC). USEC operates PGDP for the purpose of uranium enrichment. After announcing that it soon might cease operation, USEC entered into an arrangement with DOE, Tennessee Valley Authority, and two other energy-related parties in May 2012 in order to accommodate the energy requirements necessary for an additional year of enrichment activities.

The DOE remediation contractor for the PGDP site is LATA Environmental Services of Kentucky, LLC (LATA Kentucky). The contractor responsible for operation of the DUF_6 Conversion Facility is B&W Conversion Services, LLC (BWCS). Swift & Staley Team (SST) performs infrastructure and landlord activities at PGDP.

Accomplishments in 2012

Some notable accomplishments in 2012 include the following:

- Initiated demolition of the C-340 Complex.
- Completed removal of uranium hexafluoride piping from the C-410 Building.
- Completed Solid Waste Management Unit (SWMU) 4 Phase 1 sampling.
- Finished Southwest Plume Remedial Design Support Investigation fieldwork.
- Submitted a Remedial Investigation/Feasibility Study Report for Waste Disposal Alternatives Evaluation at PGDP.
- Began construction on Phase IIa for the C-400 Phase II Project.
- Converted approximately 4,517 metric tons of DUF_6 to a more stable oxide and aqueous hydrogen fluoride.
- Shipped and sold approximately 827,329 gal of aqueous hydrogen fluoride.
- Implemented PEGASIS, which consists of an external geographic information system and analytical data viewer that allows regulatory agencies and the general public to view Paducah Site data.

- Hosted two-day Commercial Industry Workshop to learn of any commercial interest in operating PGDP.

- Exhibited three-dimensional groundwater models of the Paducah DOE Site at West Kentucky Community and Technical College's Emerging Technology Center.

Compliance with Federal, State, and Local Laws and Regulations in 2012

All site cleanup and remediation activities are conducted in compliance with applicable federal, state, and local laws and regulations. This report is published annually for DOE in accordance with the following DOE Orders: DOE Order 450.1A, *Environmental Protection Program*;[3] DOE Order 231.1A, *Environment, Safety and Health Reporting*; DOE Order 435.1, *Radioactive Waste Management*, and DOE Order 458.1, *Radiation Protection of the Public and the Environment*.[4] Several agencies regulate activities at the Paducah Site, including DOE self-regulation; however, the principal regulating agencies are the U.S. Environmental Protection Agency (EPA) Region 4 and the Kentucky Department for Environmental Protection (KDEP). These agencies issue permits, review compliance reports, participate in joint monitoring programs, inspect the facilities and operations, and oversee compliance with the applicable laws and regulations. Compliance details are provided in Chapter 2 of this report and include the following:

- Environmental Restoration and Waste Management
- Radiation Protection
- Air Quality and Protection
- Water Quality and Protection

Compliance with environmental regulations and with DOE Orders related to environmental protection provides assurance that on-site processes minimize impact to the public or environment. Information provided in the 2012 ASER documents this compliance. During CY 2012, LATA Kentucky performed environmental remediation work at PGDP under contract DE-AC30-10CC40020. The work scope included activities such as performing groundwater and soil remedial actions, groundwater and surface water monitoring, D&D of facilities, and operating on-site waste storage facilities, as well as surveillance and maintenance activities involving hazardous, radioactive, and mixed wastes. During CY 2012, the contractor responsible for operation of the DUF_6 Conversion Facility was BWCS. During 2012, DOE contractors received five Notices of Violation (NOVs) (January 13, 2012; two on March 1, 2012; and two on October 4, 2012) from KDEP for alleged violations of Resource Conservation and Recovery Act (RCRA) and Kentucky Pollutant Discharge Elimination System (KPDES) permit requirements. The NOVs are explained more fully below.

On January 13, 2012, KDEP's Division of Enforcement (KDENF) issued an NOV for alleged violations related to the RCRA permit for storing hazardous waste in a unit not specified in the permit.

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[3] DOE Order 436.1 replaced Order 450.1 on May 2, 2011, and will be implemented in 2013 under LATA Kentucky contract DE-AC30-10CC40020.

[4] DOE Order 458.1 replaced Order 5400.5 on February 11, 2011, and sampling strategies were implemented in 2013 under LATA Kentucky contract DE-AC30-10CC40020, as part of the Environmental Radiation Protection Program that was documented and approved in 2012. Order 458.1 states that contractor requirements documents that have been incorporated into a contract remain in effect unless and until the contract is modified either to eliminate requirements that no longer are applicable or substitute a new set of requirements. Sampling conducted in 2012 was conducted under Order 5400.5; as such, 2012 data are compared to derived concentration guides. Sampling in 2013 is conducted under Order 458.1, and will be compared to derived concentration standards.

On March 1, 2012, KDENF issued two NOVs for alleged violations related to the KPDES permit. The first was for discharges from Outfall 001 in October 2011 that were below the minimum pH permitted limit. The second occurred in November 2011 for exceeding the daily maximum and monthly average effluent limitation for zinc discharged from Outfall 017.

On October 4, 2012, KDENF issued an NOV for alleged violations related to the KPDES permit that occurred in April 2012 for exceeding the daily maximum and monthly average effluent limitation for zinc discharged from Outfall 017.

Also on October 4, 2012, KDENF issued an NOV for alleged violations related to the KPDES permit that occurred in May 2012 for exceeding the daily maximum and monthly average effluent limitation for total suspended solids discharged from Outfall 001.

Environmental Management System

The Environmental Management System (EMS) is designed to integrate environmental protection, environmental compliance, pollution prevention, and continual improvement into work planning and execution throughout all work areas. DOE Order 450.1A requires implementation of sound stewardship practices that protect air, water, land, and cultural and ecological resources impacted by DOE operations. This objective is to be accomplished by implementing an EMS. DOE defines EMS as a continuous cycle of planning, implementing, evaluating, and improving processes and actions to achieve environmental missions and goals. The PGDP's EMS conforms to the five core elements of the International Organization for Standardization EMS standard (ISO 14001). The major elements of an effective EMS include (1) policy, (2) planning, (3) implementation and operation, (4) checking, and (5) management review. Through implementation of EMS, effective protection to workers, the surrounding communities, and the environment can be achieved while meeting operating objectives that comply with legal and other requirements. EMS feedback information is analyzed to determine the status of the EMS program relative to implementation, integration, and effectiveness.

The Paducah Site performs environmental surveillance monitoring, which is the collection and analysis of samples or direct measurements of air, water, sediment, and other media from DOE sites for the purpose of determining compliance with applicable standards and permit requirements, assessing radiation exposures to members of the public, and assessing the effects, if any, on the local environment.

DOE Order 231.1A requires the timely collection, reporting, analysis, and dissemination of information on environment, safety, and health issues as required by law or regulations or as needed to ensure that DOE is kept fully informed on a timely basis about events that could adversely affect the health and safety of the public or site workers, the environment, the DOE mission, or the credibility of DOE.

In 2012, work continued under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) to ensure that environmental impacts at the site are investigated and remediated. Site cleanup activities will occur in a sequenced approach consisting of (1) pre-shutdown scope, (2) post-shutdown scope, and (3) Comprehensive Site Operable Unit (CSOU) scope. The pre-shutdown scope with media-specific operable units (OUs) has been initiated prior to shutdown of the operating gaseous diffusion plant (GDP). The source areas for the pre-PGDP shutdown scope have been grouped into these media-specific OUs:

- Groundwater OU
- Surface Water OU
- Soils OU

- Burial Grounds OU
- D&D OU

Once PGDP ceases operation and a decision has been made to proceed with D&D of PGDP, a series of post-PGDP shutdown activities will be implemented. The final CSOU evaluation will occur following plant shutdown and completion of D&D of the GDP, D&D of the DUF_6 Conversion Facility, and completion of post-shutdown cleanup of each of the specific OUs.

DOE Order 436.1 and Executive Order (EO) 13514 require information concerning the responsibilities of managing sustainability of the PGDP site including (1) to ensure DOE carries out its missions in a sustainable manner that addresses national energy security and global environmental challenges, while advancing sustainable, reliable, and efficient energy for the future; (2) to initiate wholesale cultural change to factor sustainability and greenhouse gas reductions into all of DOE's corporate management decisions; and (3) to ensure that DOE achieves the sustainability goals established in its Site Sustainability Plan (SST 2012) pursuant to any applicable laws, regulations, EOs, sustainability initiatives, and related performance scorecards.

In addition to making physical changes at the facility to increase sustainability, another objective is to increase awareness of the sustainability opportunities in the workers and the surrounding community through public outreach and training. A detailed summary of the 2012 long-term planned actions and performance goals is presented in Chapter 3.

The goal of the Environmental Restoration Program is to evaluate and take appropriate actions to address releases from past operations to ensure protection of human health and the environment. In May 1994, PGDP was added to EPA's National Priorities List (NPL). Two federal laws, RCRA and CERCLA, are the primary regulatory drivers for monitoring and restoration activities at PGDP. RCRA sets the standards for managing hazardous waste; requires that permits be obtained for DOE facilities that treat, store, or dispose of hazardous waste; and requires assessment and cleanup of hazardous waste releases at SWMUs. CERCLA addresses releases of hazardous substances, contaminants, and pollutants. As a result of PGDP being placed on the NPL, DOE, EPA, and KDEP entered into a Federal Facility Agreement (FFA) in 1998. The FFA coordinates compliance with both RCRA and CERCLA requirements.

The Environmental Restoration Program supports site investigations, environmental response actions, and D&D of inactive facilities. A detailed summary of the 2012 PGDP site activities at each of the OUs is presented in Chapter 3.

Waste Disposition Program

The Paducah Site Waste Disposition Program directs the safe treatment, storage, and disposal of waste generated from DOE activities. Waste managed under the program is divided into the following eight categories:

(1) *Hazardous waste*—Waste that contains one or more of the wastes listed as hazardous under RCRA or that exhibits one or more of the four RCRA hazardous characteristics: (1) ignitability, (2) corrosivity, (3) reactivity, and (4) toxicity.

(2) *Mixed waste*—Waste containing both a hazardous component regulated under RCRA and a radioactive component regulated under the Atomic Energy Act.

(3) *Transuranic waste*—Waste that contains more than 100 nanocuries of alpha emitting transuranic isotopes per gram of waste with half-lives greater than 20 years.

(4) *Low-level radioactive waste (LLW)*—Radioactive waste not classified as high-level or transuranic.

(5) *Polychlorinated biphenyl (PCB)-containing and PCB-contaminated waste*—Waste containing or contaminated with PCBs.

(6) *Asbestos waste*—Asbestos-containing materials from renovation and demolition activities.

(7) *Solid waste*—Solid sanitary/industrial waste basically is refuse or industrial/construction debris.

(8) *PCB radioactive waste*—PCB waste or PCB items mixed with radioactive materials.

In addition to compliance with current regulations, DOE supplemental policies are enacted for management of radioactive, hazardous, PCB, PCB/radioactive, and mixed wastes. These policies include reducing the amount of wastes generated; characterizing and certifying waste before it is stored, processed, treated, or disposed of; and pursuing volume reduction and use of on-site storage, if safe and cost-effective, until a final disposal option is identified. In 2012, waste disposition activities varied, but were focused on completion of disposal of waste from D&D of the C-340 Building and C-410 Complex. The Waste Information Tracking System (WITS) at PGDP records approximately 3 million ft^3 of waste has been dispositioned to date. In 2012, approximately 43,600 ft^3 of waste was shipped off-site for treatment, disposal, and/or recycling (not including office waste), and approximately 58,700 ft^3 of waste was taken to the on-site C-746-U Landfill.

Waste Minimization/Pollution Prevention

The Waste Minimization/Pollution Prevention (WM/PP) Program at the Paducah Site provides guidance and objectives for minimizing waste generation. The program is set up to comply with RCRA and the Pollution Prevention Act, as well as applicable Commonwealth of Kentucky and EPA rules, DOE Orders, EOs, and the Site Treatment Plan. All PGDP projects are evaluated for WM/PP opportunities.

The program strives to minimize waste using the following strategies: source reduction, segregation, reuse of materials, recycling, and procurement of recycled-content products. WM/PP efforts for the site are reported using DOE's Pollution Prevention Tracking and Reporting System (PPTRS). During FY 2012, the Paducah Site diverted approximately 45 metric tons (99,000 lb) of materials from disposal. Materials recycled included paper, cardboard, batteries, scrap metal (nonradiological), tires, toner cartridges, wood pallets, oils, antifreeze, and fluorescent bulbs.

Decontamination and Decommissioning

D&D is conducted for inactive facilities and other structures contaminated with radiological and hazardous material. Facilities are accepted for D&D when they no longer are required to fulfill a site mission. Thirty-seven facilities were targeted for D&D by DOE. By the end of CY 2012, demolition had been completed for 30 of those facilities. In CY 2012, over 700 tons of PCB remediation debris from C-340 D&D was packaged for off-site shipment. Also in CY 2012, over 700 tons of demolition debris associated with D&D of C-340 was disposed of in the on-site C-746-U Landfill. Additionally, the C-720-N Scale House and five C-615 trailers were dismantled and removed. The majority of the C-720-N Scale House was recycled.

Environmental Radiological Protection Program and Dose Assessment

Some materials, like uranium that consists of radioisotopes such as uranium-234 (U-234), uranium-235 (U-235), and uranium-238 (U-238), are radioactive and give off radiation when the nucleus breaks down or disintegrates. Three kinds of ionizing radiation generated by radioactive materials or sources are alpha particles, beta particles, and gamma rays. When ionizing radiation interacts with the human body, it gives its energy to the body tissues. The amount of energy absorbed per unit weight of the organ or tissue is called absorbed dose. Many radiation sources are naturally occurring and are considered natural/background sources (e.g., sun, earth) (NCRP 2009). The body absorbs the radiation from natural sources, as well as sources that are not naturally occurring. Radioactivity is measured in Curies (or 3.7×10^{10} decays per second). Radioactivity in the environment at PGDP is normally very low and more effectively reported in picocuries (i.e., a fraction of the Curie). PGDP effluents are monitored for those radionuclides that are known to be present, or in cases where the historical data reflects low radionuclide concentration, gross alpha and beta samples are collected to demonstrate compliance with DOE Orders.

DOE Order 458.1 establishes a radiation protection standard of 100 millirem (mrem) per year from all exposure pathways to members of the public. This order defines “public dose” as the dose received by member(s) of the public from exposure to radiation and to radioactive material released by a DOE facility or operation, whether the exposure is within a DOE site boundary or off-site. It does not include doses received from occupational exposures, doses received from “background” radiation, doses received by a patient from medical procedures, or doses received from consumer products. This standard requires that exposure to members of the public to radiation sources as a consequence of all routine DOE activities shall not cause, in a year, an effective dose equivalent greater than 100 mrem, including releases from USEC.

Exposure pathways potentially contributing to radiological dose include ingestion of surface water, ingestion of sediments, direct radiation, and atmospheric release. For CY 2012, the worst-case combined internal and external dose to an individual member of the public was calculated at 1.902 mrem. This level is well below the DOE annual dose limit of 100 mrem/year for members of the public. The worst-case combined (internal and external) dose to an individual member of the public for 2012 increased from 2011 due to the revised license agreement that now allows the public access to areas in proximity to cylinder yards that are subjected to dose rates above ambient background levels. This dose still is well below standards and doses received from cosmic and terrestrial radiation.

The monitoring program for radioactivity in liquid and airborne effluents is described fully in the Paducah Site Environmental Monitoring Plan (EMP). The Paducah Site EMP is reviewed and updated each October, covering each FY; therefore, during 2012, the required monitoring was conducted under two separate EMPs. Data collected January through September 2012 followed the 2012 EMP (LATA Kentucky 2011), and data collected from October through December 2012 followed the 2013 EMP (LATA Kentucky 2012a).

DOE discontinued the deer sampling program beginning with the autumn 2011 hunting season. The lack of detection for some contaminants, such as PCBs in deer liver, was the basis for the elimination. PCB levels have been below levels the Food and Drug Administration considers safe to protect human health. In addition, a comparison of the metals detected in the deer with average chemical data from background deer collected shows no chemicals significantly above background. Remediation efforts performed by DOE and its contractors are working to control/eliminate contaminant sources at the site. This is evidenced in a downward trend of contaminants of concern found in deer tissue. Recreational activities were expanded in the DOE-owned land in the West Kentucky Wildlife Management Area in 2012. Expanded activities included youth turkey hunting, horseback riding, hiking, dog training and trials, gun hunting for small game, increased bow hunting for deer, mountain biking, and nature hiking. The expansion took effect January 1, 2012, after a new five-year license agreement was signed between the Kentucky Department of Fish and Wildlife Resources and DOE, but most activities were not implemented until the fall 2012 hunting season.

Environmental Nonradiological Program Information

Responsibility for nearly all nonradioactive airborne emission sources at PGDP was turned over to USEC, as a result of the 1993 lease agreement between USEC and DOE. Only a few fugitive sources, such as gravel roads, soil piles (resulting from construction excavation, including C-340 D&D), and point sources (including DUF_6 Conversion Facility operations and CERCLA cleanup activities), remained the responsibility of DOE in 2012. The small amount of emissions from DOE sources results in Clean Air Act classification of the Paducah Site as a minor air emissions source.

The nonradiological environmental surveillance program at the Paducah Site assesses the effects of DOE operations on the site and the surrounding environment. Surveillance includes analyses of air, surface water, groundwater, and sediment. Monitoring of nonradiological parameters in liquid effluents is summarized in the Paducah Site EMP (LATA Kentucky 2011; LATA Kentucky 2012a) and includes the KPDES Permit KY0004049 and Kentucky Division of Waste Management (KDWM) landfill permits SW07300014, SW07300015, and SW07300045. Effluents are monitored for nonradiological parameters listed on the permit.

In addition to the OUs identified, KDWM issued a Hazardous Waste Facility Permit (KY8-982-008-890) to address three permitted storage and treatment facilities (C-733, C-746-Q, and C-752-A) and one closed hazardous waste landfill. DOE and its remediation contractor also were issued a consolidated solid waste permit that covers the two closed landfills and one operating solid waste contained landfill. Kentucky Division of Water has issued a KPDES permit to the Paducah Site.

Groundwater Protection Program

Monitoring and protection of groundwater resources at the Paducah Site are required by federal and Commonwealth of Kentucky regulations and by DOE Orders. Groundwater is not used for on-site purposes. Beginning in 1988, when off-site contamination from the Paducah Site was discovered, DOE has provided an alternate water supply to affected residences.

A CERCLA/Administrative Consent Order Site Investigation, completed in 1991, determined the primary off-site contaminants in the Regional Gravel Aquifer (RGA) to be TCE and technetium-99 (Tc-99). TCE was used until 1993 as an industrial degreasing solvent. Tc-99 is a fission by-product contained in nuclear power reactor returns that were brought on-site through 1976 for reenrichment of uranium-235 (DOE 2001). Such reactor returns no longer are used in the enrichment process; however, Tc-99 still is present in the system. Known or potential sources of TCE and Tc-99 include former test areas and other facilities, spills, leaks, buried waste, and leachate derived from contaminated scrap metal.

Approximately 393 monitoring wells (MWs) and residential wells were sampled in accordance with DOE Orders and federal, state, and local requirements during 2012. Well sampling is included in several different monitoring programs. During 2012, groundwater monitoring was conducted at several landfills on-site (C-404, C-746-S&T, C-746-U, and C-746-K); off-site at 16 residential wells and at 1 carbon filtration system. Additionally, MWs monitor the Northwest Plume and the Northeast Plume.

During 2012, MWs at the C-404 Landfill were sampled and analyzed for total and dissolved metals (chromium, arsenic, cadmium, lead, mercury, selenium, and uranium), TCE, Tc-99, U-234, U-235, and U-238. Field parameters (e.g., temperature, pH, depth to water) also are collected at the C-404 Landfill MW locations. TCE concentrations in upgradient wells exceeded the maximum contaminant level (MCL) in all upgradient wells and in all but one (MW92) of the downgradient wells. Chromium was detected in two downgradient wells (MW87 and MW91) above the MCL. Selenium was detected at one downgradient well (MW91) above the MCL. Tc-99 exceeded the 900 pCi/L reference value in downgradient well MW91. Exceedances for the permitted MWs are reported to KDWM in semiannual reports as directed by the permit.

The C-746-S Residential Landfill and the C-746-T Inert Landfill were used at PGDP between 1981 and 1995 for the disposal trash and garbage (C-746-S) and construction material (C-746-T). During 2012, beta activity exceeded MCLs in the downgradient wells of three of the well systems [Lower RGA (LRGA), Upper RGA (URGA), and Upper Continental Recharge System (UCRS)] and in the sidegradient wells of the LRGA and URGA at C-746-S&T Landfills. TCE concentrations also exceeded MCLs in some LRGA and URGA wells. KDWM was notified of the exceedances in quarterly reports.

The C-746-U Landfill has been used at PGDP since 1996 for the disposal of solid waste. During 2012, beta activity exceeded MCLs in some of the LRGA and URGA wells at C-746-U Landfill. TCE concentrations exceeded MCLs in upgradient and downgradient wells of the LRGA and URGA. KDWM was notified of the exceedances in quarterly reports. A groundwater assessment performed for the C-746-U Landfill shows no evidence that would indicate a release from the C-746-U Landfill (LATA Kentucky 2013a).

The C-746-K Sanitary Landfill was used at the PGDP between 1951 and 1981 primarily for the disposal of fly ash. Postclosure groundwater monitoring continues for the C-746-K Landfill on a semiannual basis. MCL exceedances of reference values were found for beta activity, 1,1-dichloroethene, *cis*-1,2-dichloroethene, TCE, and vinyl chloride sampled in the C 746-K Landfill in 2012.

For the Northwest Plume, during CY 2012, TCE concentrations in MW340, the well with highest concentrations in the Northwest Plume, remained about the same as the previous year at 13,000 μg/L, while nearby well MW339 has declined from 12,000 μg/L in CY 2010 to 580 μg/L in CY 2012, in response to the operation of the new extraction wells, which has shifted the plume as expected. During the same period, TCE concentrations declined from 700 μg/L in CY 2010 to 140 μg/L in CY 2012 in MW456 and increased from 24 μg/L in CY 2010 to 470 μg/L in CY 2012 in MW458 (both wells located on the west side of the Northwest Plume), as the west edge of the plume in the LRGA was pulled eastward, toward the extraction wells. TCE concentrations increased in the LRGA in MW500 to the east of the new extraction wells, as a zone of contamination was pulled back toward the east extraction well.

There were no significant TCE concentration changes in the wells located in the Northeast Plume area in CY 2012 MW data. All MWs indicate that the highest TCE concentration portion of the plume is being controlled when upgradient wells are compared to downgradient wells. CY 2012 data indicate all MWs were below 1,000 μg/L, which was defined as the high TCE concentration area of the plume in the Northeast Plume ROD (DOE 1995a). Likewise, Tc-99 concentrations in CY 2012 were similar to those measured in CY 2011. All Tc-99 concentrations in wells located in the Northeast Plume area were well below the 900 pCi/L reference value.

Data Quality Assurance

The Paducah Site maintains a QA/Quality Control (QC) Program to verify the integrity of data generated within the Environmental Monitoring Program. Each aspect of the monitoring program, from sample collection to data reporting, must comply with quality requirements and assessment standards. Requirements and guidelines for the QA/QC Program at the Paducah Site are established by DOE

Order 414.1C,[5] *Quality Assurance;* Commonwealth of Kentucky and federal regulations; and guidance from EPA, the American National Standards Institute, the American Society of Mechanical Engineers, the American Society for Testing and Materials, and the American Society for Quality Control. The QA/QC Program specifies organizational and programmatic elements to control equipment, design, documents, data, nonconformances, and records. Emphasis is placed on planning, implementing, and assessing activities and implementing effective corrective actions, as necessary. Program requirements are specified in project and subcontract documents to ensure that requirements are included in project-specific QA plans and other planning documents. PGDP uses the DOE Consolidated Audit Program (DOECAP)-approved laboratories. DOECAP implements annual performance qualification audits of environmental analytical laboratories and commercial waste treatment, storage, and disposal facilities (TSDFs) to support complex-wide DOE mission activities. DOECAP audit results and the corrective action plans from TSDFs are evaluated annually for those facilities that receive shipments of material from LATA Kentucky. The evaluation reviews the completion of prior audit results and any new findings or observations identified. The corrective action plan submitted by the TSDF is reviewed for adequacy in resolving the identified issues that may impact LATA Kentucky operations. Currently there are no restrictions or limitations imposed on analytical laboratories or TSDFs based on DOECAP audit results.

[5] DOE Order 414.1D replaced Order 414.1C on April 25, 2011, and will be implemented in 2013 under LATA Kentucky contract DE-AC30-10CC40020.

1. INTRODUCTION

The Paducah Gaseous Diffusion Plant (PGDP), located in McCracken County, Kentucky, has been producing enriched uranium since 1952. In July 1993, the U.S. Department of Energy (DOE) leased the production areas of the site to the United States Enrichment Corporation (USEC), a private company. DOE maintains responsibility for environmental restoration, legacy waste management, nonleased facilities management, uranium hexafluoride (UF_6) cylinder management, and decontamination and decommissioning (D&D). DOE also implements an environmental monitoring and management program to ensure protection of human health and the environment and compliance with all applicable regulatory requirements. Three prime contractors perform work supporting DOE missions at the PGDP: B&W Conversion Services, LLC, (BWCS); Swift & Staley Inc. (SST); and LATA Environmental Services of Kentucky, LLC (LATA Kentucky). This document summarizes calendar year (CY) 2012 environmental management (EM) activities, including effluent monitoring, environmental surveillance, and environmental compliance status. It also highlights significant site program efforts conducted by DOE and its contractors and subcontractors at the Paducah Site. ***This report does not include USEC environmental monitoring activities.***

DOE requires that environmental monitoring be conducted and documented for all of its facilities under the purview of DOE Order 231.1A, *Environment, Safety, and Health Reporting*.[6] Several other laws, regulations, and DOE directives require compliance with environmental standards. The purpose of this Annual Site Environmental Report (ASER) is to summarize CY 2012 EM activities at the Paducah Site, including effluent monitoring, environmental surveillance, and environmental compliance status and to highlight significant site program efforts. Paducah Site programs are coordinated by DOE's remediation contractor, LATA Kentucky. References in this report to the Paducah Site generally mean the property, programs, and facilities at or near PGDP for which DOE has ultimate responsibility.

Environmental monitoring consists of the following two major activities: effluent monitoring and environmental surveillance. Effluent monitoring is the direct measurement or the collection and analysis of samples of liquid and gaseous discharges to the environment. Environmental surveillance is the direct measurement or the collection and analysis of samples consisting of ambient air, surface water, groundwater, and sediment. Effluent monitoring and environmental surveillance are performed to characterize and quantify contaminants, assess radiation exposure, demonstrate compliance with applicable standards and permit requirements, and detect and assess the effects, if any, on the local population and environment. Multiple samples are collected throughout the year and are analyzed for radioactivity, chemical constituents, and various physical properties.

The overall goals for DOE/EM are to protect site personnel, the environment, and Paducah Site neighbors and to maintain full compliance with all current environmental regulations. The current environmental strategy is to prevent noncompliance, to identify any current compliance issues, and to develop a system for resolution. The long-range goal of DOE/EM is to reduce exposures of the public, workers, and biota to harmful chemicals and radiation.

[6] DOE Order 231.1B replaced Order 231.1A on June 27, 2011, and will be implemented in 2013 under LATA Kentucky contract DE-AC30-10CC40020.

1.1 BACKGROUND

Before World War II, the area now occupied by PGDP was used for agricultural purposes. Numerous small farms produced various grain crops, provided pasture for livestock, and included large fruit orchards. During World War II, a 16,126-acre tract was assembled for construction of the Kentucky Ordnance Works, a trinitrotoluene production facility, which subsequently was operated by the Atlas Powder Company until the end of the war. At that time, it was turned over to the Federal Farm Mortgage Corporation and then to the General Services Administration.

In 1950, the U.S. Department of Defense (DOD) and DOE's predecessor, the Atomic Energy Commission (AEC), began efforts to expand fissionable material production capacity. As part of this effort, the National Security Resources Board was instructed to designate power areas within a strategically safe area of the United States. Eight government-owned sites initially were selected as candidate areas. In October 1950, as a result of joint recommendations from DOD, U.S. Department of State, and AEC, President Harry S. Truman directed AEC to expand further production of atomic weapons. One of the principal facets of this expansion program was the provision for a new gaseous diffusion plant (GDP). On October 18, 1950, AEC approved the Paducah Site for uranium enrichment (UE) operations and formally requested the Department of the Army to transfer the site from the General Services Administration to AEC. Although construction of PGDP was not complete until 1954, production of enriched uranium began in 1952.

The plant's mission of UE has continued unchanged, and the original facilities still are in operation, albeit with substantial upgrading and refurbishment. Of the 7,566 acres acquired by the AEC, 1,361 acres subsequently were transferred to Tennessee Valley Authority (TVA) (Shawnee Fossil Plant site), and 2,781 acres were conveyed to the Commonwealth of Kentucky for wildlife conservation and for recreational purposes [West Kentucky Wildlife Management Area (WKWMA)]. DOE's current holdings at the Paducah Site total 3,556 acres, including easements (133 acres).

Recycled uranium from nuclear reactors was introduced into the PGDP enrichment "cascade" in 1953 and continued through 1964. In 1964, cascade feed material was switched solely to virgin-mined uranium. Use of recycled uranium resumed in 1969 and continued through 1976. In 1976, the practice of recycling uranium feed material from nuclear reactors was halted and never resumed. During the recycling time periods, Paducah received approximately 100,000 tons of recycled uranium containing an estimated 328 grams of plutonium-239 (Pu-239), 18,400 grams of neptunium-237 (Np-237), and 661,000 grams of technetium-99 (Tc-99). The majority of the Pu-239 and Np-237 was separated out during the initial chemical conversion to uranium hexafluoride (UF_6). Concentrations of transuranics (e.g., Pu-239 and Np-237) and Tc-99 are believed to have been deposited on internal surfaces of process equipment and in waste products.

The Energy Policy Act of 1992 transferred operational responsibility for the UE enterprise to USEC, a government corporation that became a publicly held company in 1998. In accordance with the Energy Policy Act of 1992, USEC assumed responsibility on July 1, 1993, for enrichment operations and leased from DOE the real property, facilities, and infrastructure necessary for enrichment operations. DOE retains ownership of all facilities, as well as the responsibility for managing the disposition of legacy waste material and environmental cleanup.

1.2 DESCRIPTION OF SITE LOCALE

Location

The Paducah Site is located in a generally rural area of McCracken County, Kentucky [population approximately 66,000 (DOC 2013)]. PGDP is an active UE facility consisting of a diffusion cascade and extensive support facilities. The cascade, including product and tails withdrawal, is housed in six large process buildings. The plant is on a 3,556-acre DOE site, approximately 650 acres of which are within a fenced security area, approximately 800 acres are located outside the security fence, 133 acres are in acquired easements, and the remaining 1,986 acres are licensed to the Commonwealth of Kentucky as part of the WKWMA. The plant is in western McCracken County, 10 miles west of Paducah, Kentucky, [population approximately 25,000 (DOC 2013)] and 3.5 miles south of the Ohio River (Figure 1.1). The facility is on approximately 1,350 acres with controlled access. A buffer zone of at least 400 yd surrounds the entire fenced area. During World War II, the Kentucky Ordnance Works was operated in an area southwest of the plant on what is now a wildlife management area. USEC leases PGDP from DOE for operation.

Three small communities are located within 3 miles of the DOE property boundary at PGDP: Heath and Grahamville to the east and Kevil to the southwest. The closest commercial airport is Barkley Regional Airport, approximately 5 miles to the southeast. The population within a 50-mile radius of PGDP is about 665,000. Within a 10-mile radius of PGDP, the population is about 89,000 (ESRI 2012).

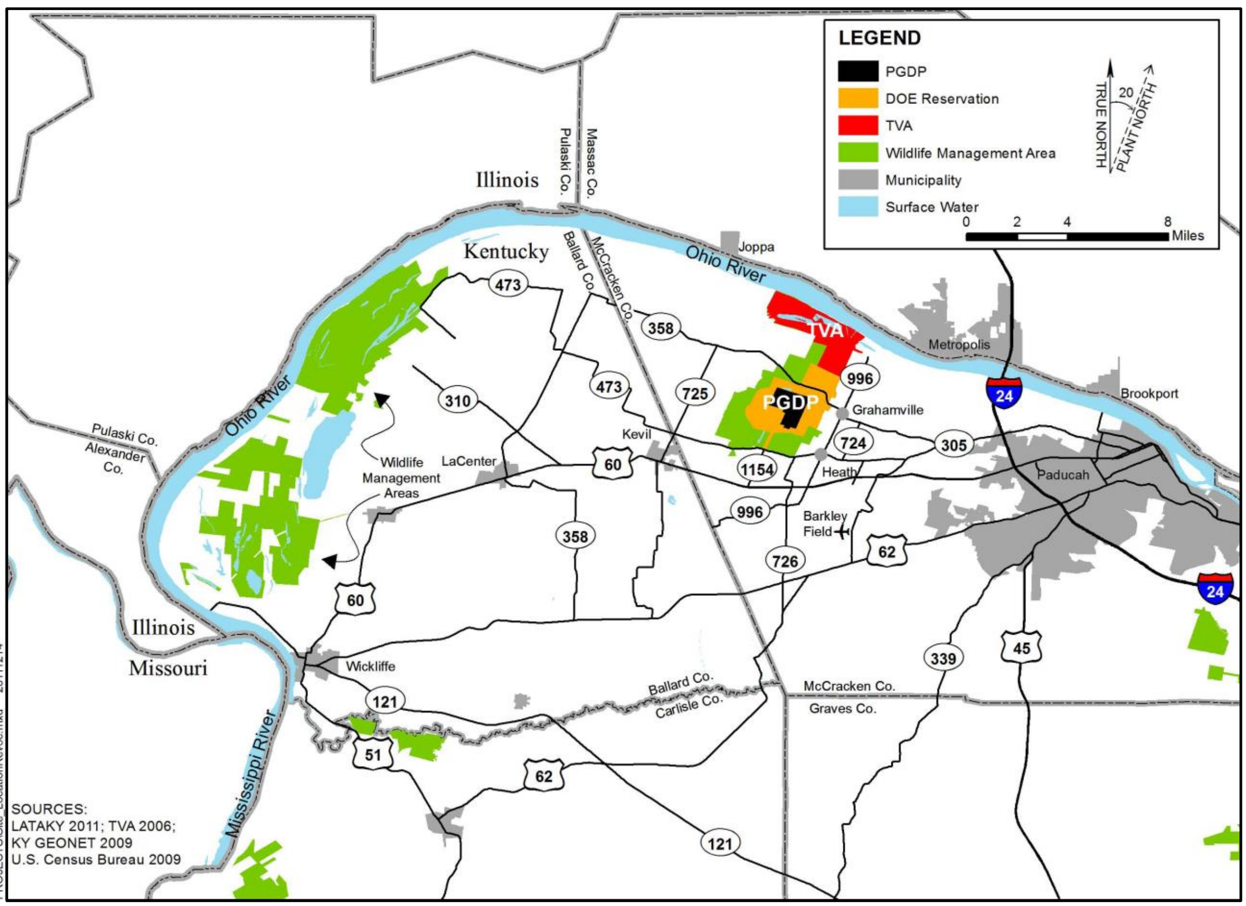

Figure 1.1. Location of the Paducah Site

Climate

The Paducah Site is located in the humid continental zone where summers are warm (July averages 79°F) and winters are moderately cold (January averages 35°F). Yearly precipitation averages about 49 inches. The prevailing wind is from the south-southwest at approximately 10 miles per hour.

Surface Water Drainage

The Paducah Site is situated in the western part of the Ohio River basin. The confluence of the Ohio River with the Tennessee River is about 15 miles upstream of the site, and the confluence of the Ohio River with the Mississippi River is about 35 miles downstream. PGDP is located on a local drainage divide. Surface water from the east side of the plant flows east-northeast toward Little Bayou Creek, and surface water from the west side of the plant flows west-northwest toward Bayou Creek. Bayou Creek is a perennial stream that flows toward the Ohio River along a 9-mile course. Little Bayou Creek is an intermittent stream that flows north toward the Ohio River along a 7-mile course. The two creeks converge 3 miles north of the plant before emptying into the Ohio River.

Flooding in the area is associated with Bayou Creek, Little Bayou Creek, and the Ohio River. Maps of the calculated 100-year flood elevations show that all three drainage systems have 100-year floodplains located within the DOE boundary at PGDP, but not within the industrialized area of PGDP (FEMA 2013).

Wetlands

More than 1,100 separate wetlands, totaling over 1,600 acres, were found in a study area of about 12,000 acres in and around the Paducah Site (COE 1994). More than 60% of the total wetland area is forested.

Soils and Hydrogeology

Soils of the area are predominantly silty loams that are poorly drained, acidic, and have little organic content.

The local groundwater flow system at the Paducah Site contains the following four major components (listed from shallowest to deepest): (1) the Terrace Gravel, (2) the Upper Continental Recharge System (UCRS), (3) the Regional Gravel Aquifer (RGA), and (4) the McNairy flow system. These components are described in more detail in Chapter 6.

1.3 ECOLOGICAL RESOURCES

Vegetation

Much of the Paducah Site has been impacted by human activity. Vegetation communities on the reservation are indicative of old field succession (e.g., grassy fields, field scrub-shrub, and upland mixed hardwoods). The open grassland areas, most of which are managed by WKWMA personnel, are mowed periodically or burned to maintain early successional vegetation, which is dominated by members of the *Compositae* family and various grasses. Species commonly cultivated for wildlife forage are corn, millet, milo, and soybean (CH2M HILL 1992).

Field scrub-shrub communities consist of sun tolerant wooded species such as persimmon, maples, black locust, sumac, and oaks (CH2M HILL 1991). The undergrowth varies depending on the location of the woodlands. Wooded areas near maintained grasslands have an undergrowth dominated by grasses. Other communities contain a thick undergrowth of shrubs, including sumac, pokeweed, honeysuckle, blackberry, and grape.

Upland mixed hardwoods contain a variety of upland and transitional species. Dominant species include oaks, shagbark and shellbark hickory, and sugarberry (CH2M HILL 1991). The undergrowth here varies, with limited undergrowth for more mature stands of trees, to dense undergrowth similar to that described for a scrub-shrub community.

Wildlife

Wildlife species indigenous to hardwood forests, scrub-shrub, and open grassland communities are present at the Paducah Site. A list of representative species is provided in *Results of the Site Investigation Phase 1* (CH2M HILL 1991a). Additionally, the Ohio River, which is 3 miles north of the Paducah Site, serves as a major flyway for migratory waterfowl (DOE 1995b). Fish populations in Bayou Creek and Little Bayou Creek are dominated numerically by various species of shiner and sunfish.

Threatened and Endangered Species

A threatened and endangered species investigation identified federally listed, proposed, or candidate species potentially occurring at or near the Paducah Site (COE 1994). Updated information is obtained on a regular basis from federal and Commonwealth of Kentucky sources. Currently, potential habitat for 12 species of federal concern exists in the study area. Eleven of these species are listed as “endangered” under the Endangered Species Act of 1973 and 1 is proposed (Chapter 2, Table 2.3). While there are potential habitats for endangered species on DOE property, none of the federally listed or candidate species has been found on DOE property at the Paducah Site.

1.4 SITE PROGRAM MISSIONS

The following two major programs are operated by DOE at the Paducah Site: (1) EM and (2) Uranium Programs. Environmental Restoration, Waste Disposition, and D&D are projects under the EM Program. The mission of the Environmental Restoration Project is to ensure that releases from past operations at the Paducah Site are investigated and that appropriate response action is taken for protection of human health and the environment in accordance with the Federal Facility Agreement (FFA) (EPA 1998). The mission of the Waste Disposition Project is to characterize and dispose of waste stored on-site in compliance with regulatory requirements and DOE Orders. The major mission of the D&D Project is to D&D excess buildings (i.e., inactive with no reuse potential) to minimize or eliminate the possible health and environmental hazards caused by the uncontrolled release of hazardous substances from contaminated structures. The major missions of the Uranium Program are to maintain safe, compliant storage of the DOE depleted UF_6 (DUF_6) inventory until final disposition, operation of a facility for the conversion of DUF_6 to a more stable oxide and aqueous hydrogen fluoride, and to manage facilities and grounds not leased to USEC. The environmental monitoring summarized in this report supports all DOE programs/projects.

2. COMPLIANCE SUMMARY

The policy of DOE and its contractors and subcontractors at the Paducah Site is to conduct operations safely and minimize or eliminate the adverse impact of operations on the environment. Protection of the environment is considered a responsibility of paramount importance. The Paducah Site maintains an environmental compliance program aimed at satisfying all applicable requirements and protecting human health and the environment.

2.1 INTRODUCTION

This chapter summarizes the 2012 compliance status for the following:

- Major environmental regulations and statutes;
- Environmental Executive Orders (EOs);
- DOE Orders, compliance and/or cleanup agreements;
- Notices of Deficiencies, Notices of Intent to Sue, Notices of Violations (NOVs), or any other enforcement actions issued to the site;
- Noncompliance issues or corrective actions;
- Status of any environmental audits or self-assessments; and
- Listing of existing permits.

Principal regulating agencies are the U.S. Environmental Protection Agency (EPA), Region 4, and the Kentucky Department for Environmental Protection (KDEP). These agencies issue permits, review compliance reports, participate in joint monitoring programs, inspect facilities and operations, and oversee compliance with applicable laws and regulations.

The EPA develops, promulgates, and enforces environmental protection regulations and technology-based standards as directed by statutes passed by the U.S. Congress. In most instances, EPA has delegated regulatory authority to KDEP when the Kentucky program meets or exceeds EPA requirements.

2.2 ENVIRONMENTAL RESTORATION AND WASTE MANAGEMENT

Comprehensive Environmental Response, Compensation, and Liability Act

DOE and EPA Region 4 entered into an Administrative Consent Order (ACO) in August 1988 under Sections 104 and 106 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The ACO was in response to the off-site groundwater contamination detected at the Paducah Site in July 1988.

On May 31, 1994, the Paducah Site was placed on the EPA National Priorities List (NPL), which is a list of sites across the nation designated by EPA as having the highest priority for site remediation. The EPA uses the Hazard Ranking System to determine which sites should be included on the NPL.

Section 120 of CERCLA requires federal agencies with facilities on the NPL to enter into an FFA with the EPA. The FFA, which was signed February 13, 1998, by DOE, EPA, and KDEP, established a decision-making process for remediation of the Paducah Site and coordinates CERCLA remedial action requirements with Resource Conservation and Recovery Act (RCRA) corrective action requirements. DOE, EPA, and KDEP agreed to terminate the CERCLA ACO because those activities could be continued under the FFA. The FFA requires DOE to submit an annual Site Management Plan (SMP) to EPA and KDEP. The SMP summarizes the remediation work completed to date, outlines remedial priorities, and contains schedules for completing future work. The SMP is submitted to the regulators annually in November to update the enforceable milestones and to include any new strategic approaches.

Comprehensive Environmental Response, Compensation, and Liability Act Reportable Quantities

In 2012, there were no spills of CERCLA-regulated substances above CERCLA reporting requirements.

Superfund Amendments and Reauthorization Act

The Superfund Amendments and Reauthorization Act (SARA) amended CERCLA on October 17, 1986. SARA reflected EPA's experience in administering the complex Superfund program and made several important changes and additions to the program. Changes of particular importance are (1) increased the focus on human health problems posed by hazardous waste sites, and (2) encouraged greater citizen participation in making decisions on how sites should be cleaned up.

Emergency Planning and Community Right-to-Know Act

Also referred to as Title III of SARA, the Emergency Planning and Community Right-to-Know Act (EPCRA) requires reporting of emergency planning information, hazardous chemical inventories, and releases to the environment, including greenhouse gases (GHGs).

EPCRA's primary purpose is to inform communities and citizens of chemical hazards in their areas. In order to ensure proper and immediate responses to potential chemical hazards, EPCRA Section 304 requires facilities to notify state emergency response commissions and local emergency planning committees of releases of hazardous substances and extremely hazardous substances when the release equals or exceeds the reportable quantity. Sections 311 and 312 of EPCRA require businesses to report the locations and quantities of chemicals stored on-site to state and local governments in order to help communities prepare to respond to chemical spills and similar emergencies (when chemicals exceed a 10,000 lb reporting threshold). EPCRA Section 313 requires EPA and the states to collect data annually on releases and transfers of certain toxic chemicals from industrial facilities and make the data available to the public.

The Paducah Site did not have any releases that were subject to EPCRA Section 304 notification requirements during 2012. In 2012, an EPCRA Section 311 notification was sent for new chemicals in excess of the 10,000 lb reporting threshold. These chemicals were acquired for a Posi-Shell® mixture used as part of a landfill daily cover at the C-746-U Landfill. Figure 2.1 shows an application of the Posi-Shell® mixture to the C-746-U Landfill. An EPCRA Section 313 notification was sent by BWCS based on manufacture of hydrogen fluoride (HF) at the DUF_6 Conversion Facility in 2012. The EPCRA Section 312 Tier II report of inventories for 2012 included UF_6, uranium oxide, calcium hydroxide,

Figure 2.1. Posi-Shell® Application to C-746-U Landfill

hydrofluoric acid, compressed nitrogen, potassium hydroxide, activated carbon pellets, sodium chloride, sulfuric acid, gasoline, biodiesel fuel, and diesel fuel associated with DOE activities. [UF_6 was reported even though radioactive material is not subject to EPCRA Sections 311 and 312 (52 *FR* 38344-01).]

Resource Conservation and Recovery Act

Regulatory standards for the characterization, treatment, storage, and disposal of solid and hazardous waste are established by RCRA. Waste generators must follow specific requirements outlined in RCRA regulations for handling solid and hazardous wastes. Owners and operators of hazardous waste treatment, storage, and disposal facilities are required to obtain operating and/or postclosure permits for waste treatment, storage, and disposal activities. The Paducah Site generates solid waste, hazardous waste, and mixed waste (i.e., hazardous waste mixed with radionuclides) and operates three permitted hazardous waste storage and treatment facilities (C-733, C-746-Q, and C-752-A). The closed C-404 Hazardous Waste Landfill also is managed under requirements of the RCRA regulations and permit.

Resource Conservation and Recovery Act Hazardous Waste Permit

RCRA Part A and Part B permit applications for storage and treatment of hazardous wastes initially were submitted for the Paducah Site in the late 1980s. At that time, EPA had authorized the Commonwealth of Kentucky to administer exclusively the RCRA-based program for treatment, storage, and disposal units, but had not given the authorization to administer 1984 Hazardous and Solid Waste Amendments provisions.

The current hazardous waste management facility permit was issued to DOE on September 30, 2004. The permit became effective on October 31, 2004, and is valid until October 31, 2014. One permit modification was issued in 2012 to revise the inspection and building sump pumping schedule for the C-733 Hazardous Waste Storage Facility and to make other administrative changes to the permit application (e.g., updating contingency plan emergency coordinators, removing unused job titles from training description, clarifying plan for incompatible waste). The modification request was submitted to the Commonwealth of Kentucky on May 21, 2012, and was approved September 14, 2012.

Resource Conservation and Recovery Act Hazardous Waste Permit Notices of Violation

For CY 2012, one NOV was issued for the Hazardous Waste Facility Permit (KY8-890-008-982) for storing hazardous waste in a unit not specified in the permit. DOE provided a response in February in 2012; KDWM has not sought any additional information or enforcement related to this violation.

Solid Waste Management

PGDP disposes of a portion of its solid waste at its contained landfill facility, C-746-U. Construction of the C-746-U Landfill began in 1995 and was completed in 1996. The operation permit was received from Kentucky Division of Waste Management (KDWM) in November 1996. Disposal of waste at the landfill began in February 1997. A new operation permit for the C-746-U Landfill was received from KDWM in November 2006.

During 2012, permit modifications were as follows:

(1) A modification to remove the condition requiring approval of the seismic hazard reevaluation and fault study reports before construction could begin on phases 6 thru 24 of the landfill was approved in March. The removal was requested in 2010.

(2) A modification to allow the use of Posi-Shell® as an alternative daily cover at the C-746-U Landfill was approved in July.

(3) A modification to update Attachment 20 of the technical application, the working face procedures for the C-746-U Landfill (073-00045), in response to a letter of warning, was approved in January. The initial modification was requested in 2011.

(4) A modification to update Attachment 16 of the technical application, proposing to recirculate leachate from the leachate collection system for the C-746-U Landfill (073-00045) was approved in January. The modification was requested in 2011.

(5) A modification to the groundwater monitoring requirements for the C-746-S, C-746-T, and C-746-U Landfills (073-00014, 073-00015, and 073-00045, respectively) was approved by KDWM in January. The modification proposed to remove the groundwater monitoring parameter iodine-131. The modification was requested in 2011.

During 2012, the landfill received 58,700 ft^3 of waste from varying Paducah Site operations.

The office waste generated by DOE and its contractors at the plant site is taken off-site for disposal. Only office waste generated at the C-746-U Landfill itself is disposed of at the landfill. Waste Path Services, LLC, in Calvert City, Kentucky, provides off-site disposal services of the office waste from the Paducah Site. The City of Kevil picks up the office waste from the office complexes in Kevil, Kentucky, that house many of the administrative personnel who support activities at the site.

Solid Waste Notices of Violation

For CY 2012, DOE did not receive any NOVs for its Solid Waste Landfill Permits (SW007300014, SW007300015, and SW007300045).

Federal Facility Compliance Act—Site Treatment Plan

The Federal Facilities Compliance Act (FFC Act) was enacted in October 1992. This act waived the immunity from fines and penalties that had existed for federal facilities for violations of hazardous waste management, as defined by RCRA. It also contained provisions for the development of site treatment plans (STPs) for the treatment of DOE mixed waste and for the approval of such plans by the Commonwealth of Kentucky. As a result of the complex issues and problems associated with the treatment of mixed chemical hazardous and radioactive waste (mixed waste), DOE and KDEP signed, after consideration of stakeholder input, an Agreed Order (AO)/STP on September 10, 1997. The STP facilitates compliance with the FFC Act. During 2011, DOE completed disposal of mixed wastes listed in the STP. The STP requires that DOE consider waste minimization in all projects and processes. The waste minimization program is discussed in Chapter 3. No wastes were added to the FFC Act STP during 2012.

National Environmental Policy Act

An evaluation of the potential environmental impact of certain proposed federal activities is required by the National Environmental Policy Act (NEPA). In addition, an examination of alternatives to certain proposed actions is required. Compliance with NEPA, as administered by DOE's NEPA Implementing Procedures (10 *CFR* § 1021) and the Council on Environmental Quality Regulations (40 *CFR* § 1500–1508), ensures that consideration is given to environmental values and factors in federal planning and decision making. In accordance with 10 *CFR* § 1021, the Paducah Site conducts NEPA reviews for proposed non-CERCLA actions and determines if any proposal requires preparation of an environmental impact statement (EIS), an environmental assessment (EA), or is a categorical exclusion (CX) from preparation of either an EIS or an EA. The Paducah Site maintains records of all NEPA reviews.

The Portsmouth/Paducah Project Office (PPPO) began drafting an EA in 2012 to assess the environmental impacts associated with potential transfer of PGDP real property to third parties for possible economic development.

Numerous minor activities were within the scope of an approved EIS, EA, or the previously approved CXs for routine maintenance, small-scale facility modifications, and site characterization. The DOE Paducah Site Office and the PPPO NEPA compliance officer approve and monitor the internal applications of previously approved CX determinations.

In accordance with the 1994 DOE Secretarial Policy Statement on NEPA, preparation of separate NEPA documents for environmental restoration activities conducted under CERCLA no longer is required. Instead, the DOE CERCLA process incorporates "NEPA values." The NEPA values are environmental issues that affect the quality of the human environment. Documentation of NEPA values in CERCLA documents allows the decision makers to consider the potential effects of proposed actions on the human environment. Actions conducted under CERCLA are discussed in Chapter 3 of this report.

Toxic Substances Control Act

In 1976, the Toxic Substances Control Act (TSCA) was enacted with a twofold purpose: (1) to ensure that information on the production, use, and environmental and health effects of chemical substances or mixtures is obtained by the EPA; and (2) to provide the means by which the EPA can regulate chemical substances/mixtures (e.g., PCBs, asbestos, chlorofluorocarbons, and lead).

Polychlorinated Biphenyls

The Paducah Site complies with PCB regulations (40 *CFR* § 761) and the TSCA-UE-Federal Facilities Compliance Agreement (FFCA). The major activities performed in 2011 to ensure compliance included the following: maintaining compliant storage of PCB waste and PCB-contaminated wastewater; shipping PCB waste for treatment and disposal; treating and discharging PCB-contaminated wastewater; maintaining the PCB troughing system in PGDP buildings; and reporting and recordkeeping.

The TSCA-UE-FFCA between EPA and DOE was signed in February 1992. Under this agreement, action plans have been developed and implemented for removal and disposal of large volumes of PCB material at the Paducah Site. Table 2.1 shows a summary of PCB equipment in service at the Paducah Site at the end of 2012. These items are utilized in USEC operations.

Table 2.1. Summary of PCB Equipment in Service at the End of CY 2012

Type	Number in Service	Volume (gal)	PCBs (kg)
PCB Transformers	67	96,410	283,385
PCB Contaminated Transformers	8	1,800	0.52
PCB Contaminated Electrical Equipment	6	1,982	1.06
PCB Capacitors	172	516*	3,168*

*Based on estimates of approximately 3 gal fluid per capacitor; estimates are adjusted at time of removal from service.

The PCB Annual Document provides details of facility activities associated with the management of PCB materials. The annual report provides details from the previous year on PCB items that are in use, stored for reuse, generated as waste, stored for disposal, or shipped off-site for disposal. Paducah Site TSCA-UE-FFCA milestones for 2012 were completed. During CY 2012, 81 containers of solid and liquid PCB remediation wastes, laboratory wastes, bulk product wastes, and liquid wastes, weighing approximately 47,532 kg were shipped for treatment and/or disposal. PCB wastes were shipped to Energy*Solutions* in Clive, Utah; Nevada National Security Site in Nevada; Clean Harbors Deer Park, LLC, facility in La Porte, Texas; Clean Harbors PPM, LLC, facility in Coffeyville, Kansas; Diversified Scientific Services, Inc., a subsidiary of Perma-Fix, in Kingston, Tennessee; and Chemical Waste Management, Inc. facility in Emelle, Alabama. Over 100 PCB Capacitors were shipped in 24 containers to Toxco Materials Management Center in Oak Ridge, Tennessee, for decontamination before final disposition at the Clean Harbors Deer Park, LLC, facility. Additionally, over 700 tons of PCB remediation debris from C-340 D&D was packaged for off-site shipment in CY 2012. This remediation debris included PCB hydraulic machines from the facility.

The facilities operated by USEC utilize equipment that contains PCBs, such as capacitors, transformers, and electrical equipment. Both radioactive and nonradioactive PCB wastes are stored on-site in units that meet TSCA and/or TSCA-UE-FFCA compliance requirements, as applicable. Nonradioactive PCBs are transported off-site to EPA-approved facilities for disposal.

Radioactively contaminated PCB wastes are authorized by the TSCA-UE-FFCA for long-term on-site storage at the Paducah Site (i.e., beyond two years). Technology for the treatment and/or disposal of radioactively contaminated PCB wastes is being evaluated.

2.3 RADIATION PROTECTION

The PGDP complies with DOE Order 435.1, *Radioactive Waste Management*, and DOE Order 458.1, *Radiation Protection of the Public and the Environment*.[7] The programs described below indicate some of the ways PGDP complies with DOE Orders.

Radionuclide National Emission Standards for Hazardous Air Pollutants Program

Airborne emission of radionuclides from DOE facilities are regulated under 40 *CFR* § 61, Subpart H, the National Emission Standards for Hazardous Air Pollutants (NESHAP) regulations. Potential radionuclide sources at the Paducah Site in 2012 were from DUF_6 Conversion Facility, Northeast Plume Containment System (NEPCS), Northwest Plume Groundwater System (NWPGS), fugitive dust source emissions, and other miscellaneous sources. The fugitive dust source emissions include piles of contaminated scrap metal, roads, and roofs. DOE utilized ambient air monitoring data to verify insignificant levels of radionuclides in off-site ambient air. The miscellaneous sources include transport and disposal of contaminated materials in the C-746-U Landfill and decontamination of machinery and equipment unused in remediation activities (e.g., well drilling). The Radiation/Environmental Monitoring Section of the Kentucky Cabinet for Health and Family Services conducted ambient air monitoring during 2012. Additionally, in 2012, DOE began monitoring its own network of air monitors. Both networks operated the last half of 2012. Ambient air data were collected at a total of 19 sites surrounding PGDP in order to measure radionuclides emitted from Paducah Site sources, including fugitive emissions. These results are discussed in further detail in Chapter 4.

2.4 AIR QUALITY AND PROTECTION

Clean Air Act

Authority for enforcing compliance with the Clean Air Act (CAA) and subsequent amendments resides with EPA Region 4 and/or the Kentucky Division for Air Quality (KDAQ). The Paducah Site complies with federal and Commonwealth of Kentucky rules by implementing the CAA and its amendments.

Clean Air Act Compliance Status

The DUF_6 Conversion Facility operates under KDEP Conditional Major Operating Air Permit No. F-10-035 R1. The facility has two emission points. Emission point U001 is the stack for the Conversion Building. The Conversion Building houses four parallel process lines. The operation utilizes a one-step fluidized bed process to convert DUF_6 to uranium oxide powder that is collected and packaged for reuse or disposal. This is accomplished by reacting DUF_6 gas with steam, nitrogen, and hydrogen that produces aqueous hydrofluoric acid, as a saleable end product, and uranium oxide powder. Emissions from oxide handling are controlled by a high-efficiency particulate air (HEPA) filter system. Low levels of HF off-gassed from the conversion process are captured by a primary and secondary caustic scrubber system.

[7] DOE Order 458.1 replaced Order 5400.5 on February 11, 2011, and sampling strategies were implemented in 2013 under LATA Kentucky contract DE-AC30-10CC40020 as part of the Environmental Radiation Protection Program that was documented and approved in 2012. Order 458.1 states that contractor requirements documents that have been incorporated into a contract remain in effect unless and until the contract is modified to either eliminate requirements that are no longer applicable or substitute a new set of requirements. Sampling conducted in 2012, was conducted under Order 5400.5, and as such, 2012 data are compared to derived concentration guides (DCGs). Sampling in 2013, is conducted under Order 458.1, and will be compared to derived concentration technical standards (DCSs).

Emission point U002 is the HF storage and load-out area. Air that is displaced during filling and emptying of HF storage tanks is vented through a dedicated scrubber system.

Additional sources of emissions in 2012 were the NWPGS and the NEPCS. These systems are interim remedial actions (IRAs) under CERCLA that address the containment of groundwater contamination at the Paducah Site. These systems remove trichloroethene (TCE) contamination from the groundwater by air stripping. At the NWPGS, the TCE-laden groundwater passes through an air stripper to remove the TCE. The off-gas from the air stripper then passes through a carbon adsorption system to remove the TCE prior to atmospheric discharge. At the NEPCS, a cooling tower system acts as an air stripper for TCE. Concentrations of TCE in the Northeast Plume are sufficiently low that a carbon adsorption system is not required to keep emissions below regulatory threshold levels.

Asbestos Program

Numerous facilities at the Paducah Site contain asbestos materials. Compliance programs for asbestos management include identification of asbestos materials, monitoring, abatement, and disposal. Procedures and program plans are maintained that delineate scope, roles, and responsibilities for maintaining compliance with EPA, Occupational Safety and Health Administration, and Kentucky regulatory requirements, as applicable.

Pollutants and Sources Subject to Regulation

Any stationary source emitting more than 10 tons/year of any hazardous air pollutant (HAP) or 25 tons/year of any combination of HAPs is considered a major source and is subject to regulation. EPA Region 4 must examine other sources for regulation under an “area source” program. DUF_6 is a conditional major source of air pollutants. The air permit controls limit pollutant emissions to less than the major source category.

Stratospheric Ozone Protection

The DOE refrigeration units contain less than 50 lb of ozone-depleting substances; therefore, the only CAA Title VI provision that applies to the Paducah Site is the requirement to control refrigerants from leaking systems. DOE does not operate any systems that contain large amounts of refrigerants; therefore, there is no possibility of large releases of ozone depleting substances.

Clean Air Act Notices of Violation

For CY 2012, DOE did not receive any NOVs under the CAA.

2.5 WATER QUALITY AND PROTECTION

Clean Water Act

The Clean Water Act (CWA) was established primarily through the passage of the Federal Water Pollution Control Act Amendments of 1972. The CWA established the following four major programs for control of water pollution:

(1) Regulating point-source discharges into waters of the United States;
(2) Controlling and preventing spills of oil and hazardous substances;
(3) Regulating discharges of dredge and fill materials into “waters of the United States”; and
(4) Providing financial assistance for construction of publicly owned sewage treatment works.

The Paducah Site is affected primarily by the regulations for point source discharges regulated under the Kentucky Pollutant Discharge Elimination System (KPDES) permit.

Kentucky Pollutant Discharge Elimination System

The CWA applies to all nonradiological DOE discharges to waters of the United States. At the Paducah Site, the regulations are applied through issuance of a KPDES permit for effluent discharges to Bayou Creek and Little Bayou Creek. The Kentucky Division of Water (KDOW) issued KPDES Permit Number KY0004049 to the Paducah Site. KDOW issued the modification to the KPDES permit on May 30, 2012, adding BWCS as a co-permittee (responsible for Outfall 017 only). The KPDES permit calls for monitoring as an indicator of discharge-related effects in the receiving streams. Additionally, the KPDES permit requires the development and implementation of a best management practices plan to control projects with the potential to impact stormwater pollutants. These best management practices are flowed to work projects through the site Environmental Management System (EMS) and work control. The current permit expired on October 31, 2011; however, DOE and its contractors submitted a KPDES permit renewal application on May 25, 2011, and will continue to operate the facility pursuant to the expired KPDES permit until a new permit is issued.

Clean Water Act Notices of Violation

In 2011, KDEP’s Division of Enforcement (KDENF) initiated enforcement activities related to the NOVs for the KPDES permit for recurring exceedances of zinc and whole effluent toxicity at Outfall 017. A corrective action plan was developed to prevent further exceedances of zinc and whole effluent toxicity standards, which was approved on June 4, 2012.

Four NOVs were received during CY 2012 for alleged violations related to the KPDES permit. Each NOV was for an exceedance of a water quality standard:

(1) Failing the minimum permitted limit for pH in Outfall 001 during October 2011 (the reported result was 5.3 Std Unit and the permitted minimum limit is 6.0 Std Unit) (received March 1, 2012);

(2) Exceeding daily maximum permitted limits for total recoverable zinc in Outfall 017 during November 2011 (the reported daily maximum was 0.253 mg/L and the permitted limit is 0.216 mg/L) (received March 1, 2012);

(3) Exceeding average and daily maximum permitted limits for total recoverable zinc in Outfall 017 during April 2012 (the reported average and daily maximum were 0.262 mg/L and 0.321 mg/L, respectively; the permitted limits are 0.216 for both) (received October 4, 2012); and

(4) Exceeding average and daily maximum permitted limits for total suspended solids (TSS) in Outfall 001 during May 2012 (the reported average and daily maximum were 42.4 mg/L and 73.0 mg/L, respectively, and the permitted limits are 30 mg/L and 60 mg/L) (received October 4, 2012).

A summary of the CY 2012 KPDES permit exceedances or noncompliances is provided in Table 2.2.

Table 2.2. KPDES Noncompliances in CY 2012

Permit Type	Outfall	Parameter	Number of Permit Exceedances	Number of Samples Taken	Number of Compliant Samples	Percent Compliance	Month(s) of Exceedance(s)	Description/ Solution
KPDES	017	Zinc	3	73	70	95.9%	April (3)	The permit limit for zinc was exceeded, and an NOV was received from KDENF in October 2012. Exceedances are believed to be caused from cylinders with oxidizing zinc-based paint. A passive zinc treatment system was installed near the cylinder storage yards in the fall of 2012. The stormwater runoff from the yards flows through the absorption media prior to discharge to the outfall. No zinc exceedances of the permit occurred in 2012, after the completion of the passive treatment system.
KPDES	017	Acute Toxicity	6	36	30	83.3%	January, March (2), July, November, December	A Toxicity Reduction Evaluation Plan has been developed and is being implemented to address these exceedances.[a]
KPDES	017	Chronic Toxicity	3	10	7	70.0%	February, November, December	The Toxicity Reduction Evaluation Plan for Acute Toxicity has been revised to address these exceedances.[a]
KPDES	001	TSS	3	26	23	88.5%	May (3)	TSS was exceeded due to unusual weather that resulted in muddy rain. An NOV was received from KDENF in October 2012. This exceedance was measured on May 1, 2012, following a heavy rain. An investigation and follow-up conducted on May 2, 2012, found no obvious cause and that the TSS had returned to normal. As a result, KDOW did not require any follow-up corrective actions.

[a] The Toxicity Reduction Evaluation Plan was revised in March 2013 to reflect permit changes from acute to chronic testing. KDOW approved this revision on April 3, 2013.

2.6 OTHER ENVIRONMENTAL STATUTES

Endangered Species Act

The Endangered Species Act of 1973, as amended, provides for the designation and protection of endangered and threatened animals and plants. The act also serves to protect ecosystems on which such species depend. At the Paducah Site, proposed projects are reviewed, in conjunction with the EMS or the CERCLA process, to determine if activities have the potential to impact these species. If necessary, project-specific field surveys are performed to identify threatened and endangered species and their habitats, and mitigating measures are designed, as needed. When appropriate, DOE initiates consultation with the U.S. Fish and Wildlife Service and Kentucky Department of Fish and Wildlife Resources prior to implementing a proposed project.

Table 2.3 includes 12 federally listed, proposed, or candidate species that have been identified as potentially occurring at or near the Paducah Site. None of these species have been reported as sighted on the DOE Reservation, although potential summer habitat exists there for the Indiana Bat. No DOE project at the Paducah Site during 2012 impacted any of these identified species or their potential habitats.

Table 2.3. Federally Listed, Proposed, and Candidate Species Potentially Occurring within the Paducah Site Study Area[a]

Common Name	Scientific Name	Endangered Species Act Status
Indiana Bat[b]	*Myotis sodalis*	Listed Endangered
Fanshell	*Cyprogenia stegaria*	Listed Endangered
Pink Mucket	*Lampsilis abrupta*	Listed Endangered
Ring Pink	*Obovaria retusa*	Listed Endangered
Orangefoot Pimpleback	*Plethobasus cooperianus*	Listed Endangered
Clubshell	*Pleurobema clava*	Listed Endangered
Rough Pigtoe	*Pleurobema plenum*	Listed Endangered
Fat Pocketbook	*Potamilus capax*	Listed Endangered
Spectaclecase	*Cumberlandia monodonta*	Listed Endangered
Sheepnose	*Plethobasus cyphyus*	Listed Endangered
Rabbitsfoot	*Quadrula c. cylindrical*	Proposed
Interior Least Tern	*Sterna antillarum athalassos*	Listed Endangered

[a] All of the listed species are identified as an Endangered, Threatened, or Candidate Species known or with the potential to be located within McCracken County, KY, by the U.S. Fish and Wildlife Service (April 10, 2013). Note that the area encompasses all of McCracken County not just the DOE Reservation. None of these species have been reported as sighted on the DOE Reservation, although potential summer habitat exists there for the Indiana bat.
[b] Specimens of the Indiana bat were netted, identified, measured, and released on WKWMA property in 1991 and 1999.

National Historic Preservation Act

The National Historic Preservation Act of 1966 is the primary law governing a federal agency's responsibility for identifying and protecting historic properties [cultural resources included in or eligible for inclusion in the National Register of Historic Places (NRHP)]. Historic properties include buildings of historic significance and archeological sites. PGDP buildings were assessed in the Cultural Resources Management Plan (BJC 2006). Archeological resources will be addressed as undisturbed land is developed for site use, or if undisturbed sites are considered to be impacted by DOE operations.

The Cultural Resources Management Plan identified an NRHP-eligible historic district at the facility. The PGDP Historic District contains 101 contributing properties and is eligible for the NRHP under National Register Criterion A for its military significance during the Cold War and for its role in commercial nuclear power development. The PGDP historic district encompasses the area of the process buildings; the switchyards; the C-100 Administration Building; cooling towers and pump houses; security facilities; water treatment facilities; storage tanks; and the support, maintenance, and warehouse buildings. A map and the rationale for designating the area as such are included in the Cultural Resources Management Plan.

Migratory Bird Treaty Act

The Migratory Bird Treaty Act of 1918 is applicable to PGDP. DOE takes measures to minimize impacts to migratory birds by avoiding disturbance of active nests. Work control documents implement this restriction.

Environmental, Energy, and Economic Performance

On October 5, 2009, the President signed EO 13514, *Federal Leadership in Environmental, Energy and Economic Performance*. This EO requires federal agencies to inventory, report, and reduce GHG emissions. This EO requires DOE to calculate an emissions baseline and establish targets for reduction of GHG. The Paducah Site will support DOE's goals to achieve reduced GHG emissions. The Site Sustainability Plan (SSP) for PGDP was submitted in December 2012 (SST 2012). Details concerning the site's energy, transportation, environmental sustainability performance, including water conservation, energy efficiency, fleet management, and sustainable design/high performance building goals are in compliance with the DOE's sustainability goals. Details of the objectives of the SSP are outlined in Section 3.2.

Floodplain/Wetlands Environmental Review Requirements

Title 10 *CFR* § 1022 establishes procedures for compliance with EO 11988, *Floodplain Management*, and EO 11990, *Protection of Wetlands*.

In late 2011, the Federal Emergency Management Agency as part of the National Flood Insurance Program issued revised flood insurance rate maps (FEMA 2013). These maps are now used for regulatory and planning purposes at the Paducah Site. No floodplain or wetlands notices of involvement were published in the *Federal Register* for the Paducah Site. In addition, DOE did not apply for any individual permits from the U.S. Army Corps of Engineers or for any water quality certifications from the Commonwealth of Kentucky. DOE activities did not result in significant impacts to floodplains or wetlands at the Paducah Site in 2012.

Kentucky/Department of Energy Agreement in Principle

The Kentucky/DOE Agreement in Principle (AIP) reflects the understanding and commitments between DOE and the Commonwealth of Kentucky regarding DOE's provision of technical and financial support to Kentucky for environmental oversight, surveillance, remediation, and emergency response activities.

The goal of the AIP is to maintain an independent, impartial, and qualified assessment of the potential environmental impacts from present and future DOE activities at the Paducah Site. The AIP is intended to support nonregulated activities; whereas, the FFA covers regulated activities. The AIP includes a grant to support the Commonwealth of Kentucky in conducting independent monitoring and sampling, both on-site and off-site, and to provide support in a number of emergency response planning initiatives. Included are cooperative planning, conducting joint training exercises, and developing public information about preparedness activities.

2.7 OTHER MAJOR ENVIRONMENTAL ISSUES AND ACTIONS

Underground Storage Tanks

Underground storage tank (UST) systems at the Paducah Site were used to store petroleum products such as gasoline, diesel fuel, and waste oil. These USTs are regulated under RCRA Subtitle I (40 *CFR* § 280) and Kentucky UST regulations (401 *KAR* Chapter 42).

Of the 18 USTs that have been reported to KDWM only 2 still are operational, 14 have been closed in accordance with approved closure plans, and 2 were determined not to exist. Both of the operational USTs operate under USEC's responsibility. There were no additional actions taken in 2012.

2.8 CONTINUOUS RELEASE REPORTING

Federal facilities that use, produce, or store hazardous substances in quantities that exceed specific release thresholds are required to comply with EPCRA and Title III of SARA provisions to report these inventories and planned or accidental environmental releases to state, federal, and local emergency planning authorities. Table 2.4 lists the 2012 EPCRA reporting status for PGDP.

Table 2.4. Status of EPCRA Reporting

EPCRA Section	Description of Reporting	Status[a]
EPCRA Sec. 302-303	Planning Notification	No
EPCRA Sec. 304	Extremely Hazardous Substance Release Notification	No
EPCRA Sec. 311-312	Material Safety Data Sheet/Chemical Inventory	Yes
EPCRA Sec. 313	Toxic Release Inventory Reporting	Yes

[a] An entry of "yes," "no," or "not required" is sufficient for "Status."

2.9 UNPLANNED RELEASES

There were no unplanned environmental releases for DOE operations at PGDP in CY 2012.

2.10 SUMMARY OF PERMITS

Table 2.5 provides a summary of the Paducah Site environmental permits maintained by DOE in CY 2012.

Table 2.5. Permits Maintained by DOE for the Paducah Site for CY 2012

Permit Type	Issued By	Permit Number	To
State Agency Interest ID# 3059			
Clean Water Act			
Kentucky Pollutant Discharge Elimination System	KDOW	KY0004049	DOE/LATA Kentucky/BWCS
Clean Air Act			
Conditional Major Operating Air Permit	KDEP	F-10-035R1	BWCS

Table 2.5. Permits Maintained by DOE for the Paducah Site for CY 2012 (Continued)

Permit Type	Issued By	Permit Number	To
RCRA—Solid Waste			
Residential Landfill (closed)	KDWM	SW07300014	DOE/LATA Kentucky
Inert Landfill (closed)	KDWM	SW07300015	DOE/LATA Kentucky
Solid Waste Contained Landfill (construction/operation)	KDWM	SW07300045	DOE/LATA Kentucky
RCRA—Hazardous Waste			
Hazardous Waste Facility Permit	KDWM	KY8-890-008-982	DOE/LATA Kentucky

Under the lease agreement with USEC, DOE retained responsibility for the site Environmental Restoration Program; the Enrichment Facilities Program; the Legacy Waste Management Program, including all waste inventories predating July 1, 1993; and wastes generated by subsequent DOE activities. DOE, LATA Kentucky, and BWCS are co-permittees on the KPDES compliance permit. DOE is responsible for all outfalls addressed by this permit. BWCS is responsible for Outfall 017 only. LATA Kentucky is responsible for the remaining outfalls (001, 015, 019, and 020). USEC has a separate KPDES permit to address discharges from leased facilities. DOE also has retained responsibility for facilities not leased to USEC. DOE and USEC have negotiated the lease of specific plant site facilities, written memoranda of agreement to define their respective roles and responsibilities under the lease, and developed organizations and budgets to support their respective functions. DOE is the owner, and DOE and LATA Kentucky are co-operators for RCRA-permitted facilities and are responsible for compliance with the RCRA permits. DOE is the owner and LATA Kentucky the operator of the C-746-U Landfill and the closed C-746-S and C-746-T Landfills and is responsible for compliance with the Solid Waste Landfill Permit.

2.11 REGULATORY INSPECTIONS

Paducah Site programs are overseen by several organizations, both inside and outside the DOE complex. Each year, numerous appraisals, audits, and surveillances of various aspects of the environmental compliance program are conducted. Table 2.6 outlines the inspections conducted during CY 2012.

Table 2.6. Regulatory Inspections for CY 2012

Date	Agency	Type of Inspection	Results
March 13, 2012	KDWM	Landfill	No issues
June 4, 2012	KDWM	Landfill Groundwater Reports	No issues
June 13, 2012	KDWM	Landfill	No issues
August 14–15, 2012	KDWM EPA	Hazardous Waste Facility Compliance Inspection	3 observations*
September 11, 2012	KDAQ	DAQ-Asbestos-NESHAP	No issues
October 11, 2012	KDAQ	DAQ-Asbestos (C-340)	No issues

*The observations were insufficient training, open containers for universal waste, and an exceeded accumulation time for universal waste. All observations were corrected.

3. ENVIRONMENTAL PROGRAM INFORMATION

Sound stewardship practices, environmental monitoring, environmental restoration, waste disposition, facilities management, UF_6 cylinder management activities, and D&D occur at DOE facilities at the Paducah Site. Programs that support these activities are presented in this chapter to inform the public.

3.1 ENVIRONMENTAL MANAGEMENT SYSTEM

The EMS is designed to integrate environmental protection, environmental compliance, pollution prevention, and continual improvement into work planning and execution throughout all work areas. The Paducah Site EMS is based on the objectives of DOE Order 450.1A and implements sound stewardship practices in the protection of land, air, water, and other natural or cultural resources potentially impacted by their operations. The EMS objectives are integrated into the Integrated Safety Management System (ISMS) established by the DOE Policy 450.4, *Safety Management System Policy*.[8] The EMS for two of DOE's contractors has been audited and found to satisfy DOE requirements. The EMS for the remaining contractor was under development in 2012.

Environmental protection programs at the Paducah Site conform to the five core elements of the International Organization for Standardization (ISO) EMS standard, ISO 14001. The major elements of an effective EMS include policy, planning, implementation and operation, checking, and management review. Through implementation of EMS, effective protection to workers, the surrounding communities, and the environment can be achieved while meeting operating objectives that comply with legal and other requirements. EMS feedback information is analyzed to determine the status of the EMS program relative to implementation, integration, and effectiveness.

During 2012, DOE contractors were responsible for compliance with all applicable laws, regulations, permit commitments, and other requirements, as defined in their respective contracts. Their Environmental Policy Statements emphasize conservation and protection of environmental resources by incorporating pollution prevention and environmental protection into the daily conduct of business. The DOE contractors implemented this policy through the programs described in this document, environmental cleanup, pollution prevention programs, and by integrating environmental protection, environmental regulatory compliance, and continual improvement into the daily planning and performance of work at PGDP. The environmental policies are communicated to employees through various methods. The DOE contractor project manager reviews and communicates the commitments in the policy with all of the other members of the DOE contractor management team. The policy is further communicated to employees and to subcontractors through sitewide communication, EMS awareness training, publications, and EMS brochures.

The EMS environmental stewardship scorecard assesses agency performance in environmentally preferable purchasing; environmental management system implementation; electronics stewardship; high

[8] DOE Policy 450.4A replaced Policy 450.4 on April 25, 2011, but has not been implemented under LATA Kentucky contract DE-AC30-10CC40020.

performance sustainable building; and environmental compliance management improvement. The EMS scorecard for PGDP in CY 2012 was green.

DOE contractors at the Paducah Site are required to implement EMS requirements. The benefits of EMS to the facility include (1) reduced risk to the facility mission; (2) improved fiscal efficiency and/or cost avoidance; (3) heightened knowledge of environmental programs at all levels of the organization; (4) empowerment of individuals to contribute to the improved environmental conditions at the site; and (5) integration of the environment into organizational culture and operations. Employees have actively recommended work controls to be used to protect the environment.

3.2 ENVIRONMENTAL MONITORING PROGRAM

DOE and its contractors are committed to enhancing its environmental stewardship and to reducing any impacts that its operations may cause to the environment. The Environmental Monitoring Program at PGDP consists of effluent monitoring, environmental surveillance, and air monitoring around the plant. Requirements for routine environmental monitoring programs were established to measure and monitor effluents from DOE operations and maintain surveillance on the effects of those operations on the environment and public health through measurement, monitoring, and calculation. LATA Kentucky implements the Environmental Monitoring Program for the Paducah Site documented in the Environmental Monitoring Plan (EMP) (LATA Kentucky 2011; LATA Kentucky 2012a), in accordance with DOE Order 450.1A, *Environmental Protection Program.* In addition to environmental monitoring documented in the EMP, BWCS also monitors radionuclide air emissions as required by their air permit. The results of these programs are discussed in detail in subsequent chapters of this ASER.

In tables presenting data from EMP sampling, some results are not available for all parameters. This is signified by a descriptor of NR meaning that the result was "not reported" because that parameter was not required at that particular location; therefore, a sample was not collected. The ND acronym signifies that the concentration was less than the laboratory reporting limit; therefore, the result was considered "not detected." In several tables, reference values are provided for which to compare results. These reference values include Kentucky regulations and maximum contaminant levels (MCLs).

Before the DOE/USEC transition (described in Chapter 1), DOE's primary mission at the Paducah Site consisted of enriching uranium. Since the transition on July 1, 1993, DOE's mission at the site has been focused on environmental restoration, DUF_6 cylinder management, and waste management. This change in mission also changed the direction and emphasis of the Environmental Monitoring Program. In November 1995, the site EMP was reissued to address DOE operations exclusively. The EMP is reviewed annually and updated at least every three years.

Site Sustainability Plan

In accordance with DOE Order 436.1 and EO 13514, this report provides information concerning the requirements and responsibilities of managing sustainability on the PGDP site including (1) to ensure DOE carries out its missions in a sustainable manner that addresses national energy security and global environmental challenges, while advancing sustainable, reliable and efficient energy for the future; (2) to initiate wholesale cultural change to factor sustainability and GHG reductions into all of DOE's corporate management decisions; and (3) to ensure that DOE achieves the sustainability goals established in its SSP pursuant to any applicable laws, regulations, EOs, sustainability initiatives, and related performance scorecards.

In addition to making physical changes at the facility to increase sustainability, another objective is to increase awareness of the sustainability opportunities in the workers and the surrounding community through public outreach and training. Table 3.1 presents a brief summary of the 2012 long-term planned actions and performance to attain the 2020 goals.

3.3 ENVIRONMENTAL RESTORATION PROGRAM

The goal of the Environmental Restoration Program is to ensure that releases from past operations and waste management activities are investigated and that the appropriate response action is taken for the protection of human health and the environment. In May 1994, PGDP was added to EPA's NPL. Two federal laws, RCRA and CERCLA, are the primary regulatory drivers for monitoring and restoration activities at PGDP. RCRA sets the standards for managing hazardous waste and requires that permits be obtained for DOE facilities that treat, store, or dispose of hazardous waste and requires assessment and cleanup of hazardous waste releases at solid waste management units (SWMUs). CERCLA addresses uncontrolled releases of hazardous substances and requires cleanup of inactive waste sites. As a result of PGDP being placed on the NPL, DOE, EPA, and KDEP entered into an FFA in 1998. The FFA coordinates compliance with both RCRA and CERCLA requirements.

The environmental restoration program supports investigations and environmental response actions, D&D of facilities no longer in use, projects designed to demonstrate or test advancements in remedial technologies, and other projects related to action for the protection of human health and the environment.

Background

In July 1988, the Kentucky Radiation Control Branch, in conjunction with the Purchase District Health Department, sampled several residential groundwater wells north of the plant in response to concerns from a local citizen regarding the quality of water in a private well. Subsequent analyses of these samples revealed elevated gross beta levels indicative of possible radionuclide contamination. On August 9, 1988, these results were reported to the Paducah Site, which responded by sampling several private groundwater wells adjacent to the site on August 10, 1988. Upon analysis, some of the samples collected contained elevated levels of both TCE and Tc-99. In response, DOE immediately instituted the following actions:

- Provided a temporary alternate water supply to affected residences;
- Sampled surrounding residential wells to assess the extent of contamination;
- Began extension of a municipal water line to affected residences as a long-term source of water; and
- Began routine sampling of residential wells around the Paducah Site.

Following the initial response actions, DOE and EPA entered into an ACO in August 1988 under Sections 104 and 106 of CERCLA. The major requirements of the ACO included monitoring of residential wells potentially affected by contamination, providing alternative drinking water supplies to residents with contaminated wells, and investigating the nature and extent of off-site contamination.

As part of the residential well sampling program that began when off-site contamination was discovered, DOE established a Water Policy in 1994. This policy provides that, in the event contamination originating from the Paducah Site is detected above plant action levels, a response will be initiated by the Paducah Site. DOE modified this Water Policy in 1994 to include provisions to extend a municipal water line to the entire area of the groundwater contamination originating from the Paducah Site.

Table 3.1. DOE Goal Summary Table

DOE Goal	Site Performance Status	Site Planned Actions
28% Scope 1 and 2 GHG reductions by fiscal year (FY) 2020 from a FY 2008 baseline (related goals).	6.6% below FY 2008 baseline, strong progress toward "28% below baseline."	The Site is below the FY 2008 baseline for this goal for the first time since inception, continued vigilance with electrical consumption and fleet fuel consumption will be required to maintain and meet performance status.
13% Scope 3 GHG reduction by FY 2020 from the FY 2008 baseline.	91.4% reduction from FY 2008, exceeding 13% required reduction.	Personnel reduction, along with a suspected high estimate for FY 2008's baseline currently has the site meeting this goal.
30% energy intensity reduction by FY 2015 from the FY 2003 baseline.	147% up from the 2003 baseline, but 26% down from FY 2011.	High energy consumption remediation projects and start-up of the DUF_6 project have greatly increased power needs for the EM Projects at Paducah. Small energy saving initiatives have been implemented with success. In light of this, Paducah continues to implement small operational type energy initiatives as life cycle analysis allows. An example of this is the new high efficiency HVAC unit on the C-103 Building.
Energy Independence and Security Act (EISA) Section 432 energy and water evaluations.	100%	The Remediation and Infrastructure contractors performed 100% of the required EISA evaluations.
Individual buildings or processes metering for 90% of electricity (by October 1, 2012); for 90% of steam, natural gas, and chilled water (by October 1, 2015).	81% of electricity. 100% of natural gas (met). 0% of water [not applicable (N/A)]. Steam and chilled water (N/A).	The FY 2011 Metering Assessment details the metered consumption and steps required to achieve this goal. Natural gas already is metered, and steam is not being used by DOE contractors. Adding meters to two of the DUF_6 facilities would allow the Site to meet this goal for electrical consumption.
Cool roofs (when economical) for roof replacements unless project already has Critical Decision-2 approval. New roofs must have thermal resistance of at least R-30.	Work in progress.	Trailers are an uneconomical place for cool roofs; however, a cool roof upgrade is being assessed for C-103 as the life cycle will require a replacement. The remaining facilities are being evaluated, but may not have the surface square footage or effective lifespan to achieve a return on investment.
15% of existing buildings larger than 5,000 gross ft^2 to be compliant with the five guiding principles (GPs) of high performance and sustainable buildings (HPSB) by FY 2015.	Initiated as life cycle allows.	As maintenance is performed at the C-103 building, the HPSB standards are given consideration.
All new construction and major renovations greater than $5 million to be Leadership in Energy and Environmental Design® Gold certified. Meet high performance and HPSB GPs if less than or equal to $5 million.	The Site currently has no projects planned that fit the requirements.	No new construction is planned for the Paducah Site; however, any upgrades to existing facilities are made with the HPSB principles in mind.
7.5% of a site's annual electricity consumption from renewable sources by FY 2010 (2x credit if the energy is produced on-site).	185% of the goal currently exceeding the requirement.	PPPO purchases and will continue to purchase Renewable Energy Certificates for Paducah and Portsmouth.

Table 3.1. DOE Goal Summary Table (Continued)

DOE Goal	Site Performance Status	Site Planned Actions
10% annual increase in fleet alternative fuel consumption by FY 2015 relative to the FY 2005 baseline.	13% decrease from FY 2010 due to fleet reduction. Goal not met.	In FY 2005 there was no E85 present at the Site, making the baseline 0. In 2012 the site was 13% down from FY 2010. The recent fleet reduction and fuel saving practices hurt this goal.
2% annual reduction in fleet petroleum consumption by FY 2015 relative to the FY 2005 baseline.	4,855% over FY 2005 baseline. 23% reduction from FY 2011.	The recent fleet reduction plan and fuel saving practices have had a continued significant impact on the petroleum consumption. Historical data provided in the Consolidated Energy Data Report shows the Paducah Site having very low petroleum consumption in FY 2005. The increased fuel consumption reflects a ramp up in manpower and vehicle usage to support the remediation mission in years subsequent to 2005.
100% of light-duty vehicle purchases must consist of alternative fuel vehicles (AFVs) by FY 2015 and thereafter. (The goal for FY 2000–2015 has been 75%.)	AFVs currently make up 36%. Hybrid electric vehicles make up 25%.	The site has requested that General Services Administration send more AFVs/hybrids as other vehicles leave the site.
Reduce fleet inventory by 35% within the next three years relative to a FY 2005 baseline.	Goal has been met.	The reduction in vehicle usage and total fleet numbers was completed in FY 2011.
26% water intensity reduction by FY 2020 from a FY 2007 baseline.	Goal met.	To meet the standard, the contractors have installed low-flow systems and ceased all landscape watering.
20% water consumption reduction of industrial, landscaping, and agricultural (ILA) by FY 2020 from the FY 2010 baseline.	N/A	FY 2010 baseline is 0. The site still is not consuming water for ILA purposes; thus, there is no reduction to record.
Divert at least 50% of nonhazardous solid waste, excluding construction and demolition debris, by FY 2015.	Currently diverting 33%.	Estimates show the Site at 33% diversion rate, the site intends to use best practices and innovation to continue to decrease municipal landfill waste.
Divert at least 50% of construction and demolition materials and debris by FY 2015.	Currently diverting 8.5%.	Non contaminated waste is recycled and reused when applicable. The site historically recycles a large amount of D&D waste when it is not contaminated.
Procurements meet sustainability requirements and include sustainable acquisition clause (95% each year).	Goal met.	Environmentally Preferred Purchasing Program allows the subcontractors to monitor all purchase orders and make additions to the list for new products.
All data centers are metered to measure monthly power usage effectiveness (PUE) (100% by FY 2015).	N/A	The Paducah Site does not have any data centers.
Maximum annual weighted average PUE of 1.4 by FY 2015.	N/A	The Paducah Site does not have any data centers in which to monitor PUE.
Electronic Stewardship—100% of eligible personal computers, laptops, and monitors with power management actively implemented and in use by FY 2012.	Goal met.	Power management is actively implemented on all computers.

ACO activities identified two off-site groundwater contamination plumes, referred to as the Northwest and Northeast Plumes; identified several potential on-site source areas requiring additional investigation; and included the evaluation of alternatives and implementation of several interim activities. Upon signing the FFA in February 1998, the FFA parties declared that the ACO requirements were satisfied and terminated the ACO because the remaining cleanup would be continued under the authority of the FFA. A series of remedial investigations (RIs) and feasibility studies (FSs) were initiated under the FFA (e.g., Waste Area Groups 1, 3, 6, 7, 22, 23, 27, and 28), including the ongoing evaluation of all major contaminant sources impacting groundwater and surface water. In accordance with the ACO and FFA, DOE actions have focused primarily on reducing potential risks associated with off-site contamination. The following are examples of the significant actions and the dates they were completed through CY 2012.

- Imposed land use controls (LUCs) (fencing and posting) to restrict public access to contaminated areas in certain outfall ditches and surface water areas (1993).

- Extended municipal water lines as a source of drinking water to affected residents to eliminate exposure to contaminated groundwater (1995).

- Constructed and implemented groundwater treatment systems for both the Northwest and Northeast Plumes to reduce contaminant migration (1995 and 1997, respectively).

- Rerouted surface runoff away from highly contaminated portions of the North-South Diversion Ditch (NSDD) to reduce potential migration of surface contamination (1995).

- Excavated soil with high concentrations of PCBs in on-site areas to reduce off-site migration and potential direct-contact risks to plant workers (1998).

- Removed and disposed of "Drum Mountain," a contaminated scrap pile potentially contributing to surface water contamination so that a potential direct-contact risk to plant workers would be eliminated and an off-site migration risk would be reduced (2000).

- Applied *in situ* treatment of TCE-contaminated soil at the cylinder drop test site using innovative technology (i.e., the Lasagna™ technology) to eliminate a potential source of groundwater contamination (2002).

- Removed petroleum-contaminated soil from SWMU 193, the former McGraw Construction Yards, now the Southside Cylinder Yards, to eliminate a potential source of groundwater contamination (2002).

- Completed installation of a sediment control basin at Outfall 001 to control the potential migration of contaminated sediment (2002).

- Completed a treatability study that demonstrated the effectiveness of the six-phase heating technology for *in situ* treatment of dense nonaqueous-phase liquid (DNAPL) at C-400 (2003).

- Completed installation of a retention basin and excavation of the on-site portions of the NSDD, which removed a source of direct-contact risk to plant workers and a potential source of surface water contamination (2004).

- Investigated potential source areas contributing to the Southwest Plume, remedial actions were evaluated (2005).

- Completed D&D of the C-603 Nitrogen Facility to the slab (2005).
- Performed a site investigation (SI) near the C-746-S&T Landfills and determined that TCE groundwater contamination is from SWMU 145, the Residential/Inert Landfill and Borrow Area (2006).
- Disposed of approximately 30,500 tons of scrap metal, which eliminated a potential direct-contact risk to plant workers and a source of surface water contamination (2006).
- Completed D&D of the C-402 Lime House to the slab (2006).
- Initiated remedial design/action for volatile organic contamination in soil and groundwater at the C-400 Cleaning Building (2006).
- Completed D&D of the C-405 Incinerator to the slab (2007).
- Completed remedial action field investigation for the Burial Grounds Operable Unit (BGOU) (2007).
- Completed D&D of the C-746-A West End Smelter to the slab (2008).
- Completed D&D of the C-342 Ammonia Disassociator Facility to the slab (2008).
- Recycled tanks from C-342 for the Leachate Collection System at C-746-U Landfill (2009).
- Signed an action memorandum (AM), completed the removal action work plan, and completed fieldwork for the removal for the Soils Inactive Facilities (C-218 Firing Range and the C-410-B Holding Pond) (2010).
- Demolished two 66-year-old concrete water towers built for a World War II-era munitions plant (2009). Concrete was recycled as aggregate, and most was returned to the site for use as backfill.
- Completed installation and initiated operations of the Northwest Plume optimization wells for enhanced groundwater capture (2010).
- Completed D&D of the C-746-A East End Smelter to the slab (2010).
- Completed the Soils OU remedial investigation fieldwork (2010).
- Sampled Soils OU SWMUs (2010).
- Completed C-400 Electrical Resistance Heating (ERH) Phase I for treatment of soil and groundwater contaminated with volatile organic compounds (VOCs) removing 550 gal of TCE (2010).
- Completed D&D of the C-411 and east expansion of the C-410 Building to the slab (2011).
- Completed systems removal and declared C-340 Building demolition ready (2011).
- Completed Surface Water OU Removal Action by obtaining regulatory approvals for the Removal Action Report (2011).

- Obtained regulatory approvals for the Soils Inactive Facilities Removal Action Report (2,700 yd^3 of contaminated soil removed from C-410-B Neutralization Pit and C-218 Firing Range) (2011).

- Completed the Soils OU RI for 86 SWMUs totaling ~ 200 acres; analyzed over 3,000 samples for various parameters (2011).

- Completed SWMU 13 Site Evaluation (SE) of a 294,000-ft^2 area formerly used for storage of clean scrap metal. The SE Report was submitted to EPA and Kentucky (2011). Elements of the SE Report will be incorporated into a subsequent Soils OU RI.

- Shipped all transuranic waste off-site, completing the last inventory of waste stored on-site under the STP (2011).

- Dismantled and removed C-720-N Scale House and five C-615 trailers (2012).

- Completed removal of UF_6 piping from the C-410 Building (2012) (see Figure 3.1).

- Completed SWMU 4 Phase 1 sampling (2012).

- Finished Southwest Plume Remedial Design Support Investigation fieldwork (2012).

Figure 3.1. Purging UF_6 from Piping in the C-410-Building

Operable Units

The National Contingency Plan states that owners of large, complex sites with multiple source areas, such as federal facilities, may choose to divide their sites into smaller areas to characterize them and to implement response actions, rather than conducting a single, sitewide comprehensive action. These discrete actions, referred to as OUs, may address a geographic portion of the site, or specific site problems, or include a series of interim actions followed by final actions. The PGDP site cleanup strategy adopts this approach and includes a series of high-priority actions, ongoing site characterization activities to support future response action decisions, and eventual D&D of the currently operating PGDP after it ceases operation, followed by a Comprehensive Site OU (CSOU) evaluation. The timing and sequencing of these actions is based on a combination of factors, including risk, compliance, and technical considerations associated with PGDP operations and other criteria, as outlined in the Paducah SMP (DOE 2012a).

CY 2012 Response Activities

Significant accomplishments for the Environmental Restoration Program conducted in CY 2012 included, but were not limited to, the following:

- Continued operation of the Northwest and Northeast Plume groundwater treatment systems (i.e., NWPGS and NEPCS). Optimized operation of the NWPGS continues to provide increased mass removal of the TCE-contaminated groundwater.
- Received conditional concurrence on the Soils OU RI Report from EPA and Kentucky. (Approval was received in 2013.)
- Submitted an RI/FS Report for CERCLA Waste Disposal Alternatives Evaluation at PGDP.
- Submitted an FS for SWMUs 2, 3, 7, and 30 of BGOU at PGDP.
- Submitted an FS for SWMUs 5 and 6 of BGOU at PGDP.
- Began construction on Phase IIa for the C-400 Phase II Project.
- Signed Final Record of Decision (ROD) for Southwest Plume sources (DOE 2012b); performed sampling to delineate further source zones to the Southwest Plume.
- Received approval for the Surface Water Operable Unit (SWOU) RI/FS Work Plan.

D&D

The D&D scope includes 37 currently inactive DOE facilities and those SWMUs and areas of concern associated with previous PGDP operations and the currently operating PGDP. Thirty inactive facilities have been completed, along with the interior component removal and the structural demolition of C-411 and the east expansion of the C-410 Complex. Transite removal was completed for the C-340 Metals Plant, and structural demolition initiated. The facilities associated with current PGDP operations will be addressed during D&D of PGDP. Additionally, the C-720-N Scale House and five C-615 trailers were dismantled and removed. The majority of the C-720-N Scale House was recycled. Figure 3.2 illustrates building prior to dismantling.

Final CSOU

The final CSOU evaluation will occur following completion of D&D of PGDP after plant shutdown. As part of the final CSOU evaluation, the land-use assumptions will be reassessed and modified, if necessary, to ensure consistency with the reasonably foreseeable land use, including any reuse initiatives that might be under consideration at that time. The final CSOU will include a sitewide baseline human health and ecological risk assessment to evaluate residual risks remaining and to identify any additional actions necessary to ensure long-term protectiveness.

Figure 3.2. C-720-N Scale House

Groundwater

Groundwater is an example of an area that has unique technical factors that need special consideration in the sequencing and decision making process. The strategy includes the following four phases:

(1) Preventing human exposure to contaminated groundwater;
(2) Preventing or minimizing further migration of the contaminant plume;
(3) Preventing or minimizing further migration of contaminants from source areas to groundwater; and
(4) Returning groundwater to beneficial uses wherever practicable.

C-400 Interim Remedial Action for Volatile Organic Compound Contamination in Groundwater

A ROD was signed by DOE and EPA in August 2005, selecting the IRA for the Groundwater Operable Unit (GWOU) VOCs source zone, comprised primarily of TCE, at the C-400 Cleaning Building at PGDP. The ROD included discussion of the contribution that this IRA will make toward the final decision for the GWOU at PGDP.

The IRA was developed to accomplish the following:

- Prevent potential exposure to contaminated groundwater to on-site industrial workers through institutional controls (e.g., excavation/penetration permit program); and

- Initiate remedial design for the C-400 groundwater action fieldwork. Reduce contamination comprised of TCE and other VOCs found in UCRS soil in the C-400 Cleaning Building area to minimize the migration of these contaminants to RGA groundwater and to off-site points of exposure.

The major components of the remedy would include the following:

- Conduct a remedial design support investigation to further determine areal and vertical extent of TCE and other VOC contamination in the C-400 Cleaning Building area to ensure optimum placement of the remediation system;

- Reduce the concentration of TCE and other VOCs in the soils in the C-400 Cleaning Building area through removal and treatment using ERH in both the UCRS and RGA;

- Collect post-action sampling results; and

- Implement LUCs at the C-400 Cleaning Building area.

In 2009, the installation for Phase I of the remedial action was initiated. In 2010, the Phase I system was operated successfully, removing 535 gal (approximately 6,500 lb) of TCE from the subsurface (DOE 2012c). A technical evaluation of Phase I, completed in 2010, documented the heating operations. The Phase I project was able to heat the UCRS as planned, but was unable to heat the lower RGA (LRGA) to target temperature. A proposed plan for the Phase II IRA, to implement an alternate approach for the RGA (staged implementation of baseline/rebound analysis and *in situ* chemical treatment), was submitted in December 2011. DOE and the regulatory agencies have been evaluating this option, as well as other technologies, and continue to identify the best approach for treatment of the LRGA.

Southwest Plume Site Investigation

The *Site Investigation Report for the Southwest Groundwater Plume at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, (DOE 2006a) documents a 2004 investigation of the on-site Southwest Plume area. The SI was conducted in accordance with the approved *Site Investigation Work Plan for the Southwest Plume at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 2004). The objectives of the SI were to collect sufficient data to do the following:

- Determine which units are sources of contamination to the Southwest Groundwater Plume;

- Determine which units are not sources of contamination to the Southwest Groundwater Plume;

- Fill data gaps for risk assessment of the identified source areas; and

- Reduce uncertainties and increase the understanding of the Southwest Groundwater Plume and potential sources so that appropriate response actions can be identified, as necessary.

The investigation evaluated the following four potential source areas of contamination to the Southwest Groundwater Plume and profiled the level and distribution of VOCs and Tc-99 in the plume along the western plant boundary.

(1) C-747-C Oil Landfarm (SWMU 1)
(2) C-720 Building, specifically areas near the northeast and southeast corners of the building
(3) Storm sewer between the south side of the C-400 Building and Outfall 008 (a part of SWMU 102)
(4) C-747 Contaminated Burial Yard (SWMU 4), further addressed in the BGOU RI/FS

Of the four areas, the investigation found that the storm sewer does not contribute VOCs or Tc-99 to the Southwest Plume (DOE 2006a).

As a result of reviews conducted by EPA regarding the Southwest Plume SI Report (DOE 2004), DOE entered into dispute resolution with EPA during 2007. The parties agreed to development of a focused FS

(FFS) in the negotiations. The FFS was developed and submitted to EPA and Kentucky for review and approval in 2009. The FFS identified ERH, along with a limited number of other alternative remediation technologies. As a result of lessons learned from the C-400 soil and groundwater ERH implementation, DOE determined that it would be beneficial to evaluate a broader range of alternatives. DOE developed a revised FFS with a broader range of alternatives in 2010 for use in determining the appropriate remedial alternative. A revised proposed plan was prepared and approved in 2011 that includes *in situ* source treatment using deep soil mixing with interim LUCs at SWMU 1 and *in situ* source treatment using enhanced *in situ* bioremediation with interim LUCs or long-term monitoring with interim LUCs for the C-720 source areas. DOE also developed and submitted a draft ROD in 2011 for regulatory agency review. A final ROD for the Southwest Plume sources was signed in March 2012 by DOE and EPA. Soil sampling to further delineate the SWMU 1 and C-720 source zones (a provision of the ROD) was performed in 2012 (see Figure 3.3).

Figure 3.3. Fieldwork Conducted in 2012 for the Southwest Plume Remedial Design Support Investigation

Northwest Plume Groundwater System

The IRA for the Northwest Plume is documented in a ROD signed by DOE and EPA in July 1993. KDEP concurred with the ROD. The IRA included the construction of the NWPGS. The NWPGS consists of two extraction well fields (each containing two extraction wells) transfer pipelines, and a fully enclosed treatment system. The NWPGS began operation August 28, 1995. The NWPGS, an interim action, is designed to reduce off-site migration of the high concentration portions of TCE and Tc-99 in the Northwest Plume. TCE is removed by an air stripping process. Activated carbon filtration beds are used to remove the TCE from the off-gas generated by the air stripper before the air is discharged to the atmosphere. Tc-99 is removed from the groundwater by an ion exchange process.

Beginning in August 2010, the NWPGS switched from withdrawal from the original four extraction wells to withdrawal from two new extraction wells located at the north boundary of the industrial area of PGDP (in the vicinity of the original south well field). The location of these extraction wells was optimized to enhance contaminant mass capture in the Northwest Plume in the area of the north plant boundary, consistent with the technical assessment of the NWPGS in the latest Five-Year Review.

The NWPGS has extracted and treated over 1,757 million gal of contaminated groundwater from start-up in 1995 through the end of 2012. The system had removed 34,449 lb of TCE from groundwater through the end of 2012. The NWPGS consistently has met the treatment goals documented in the ROD of 5 ppb TCE and 900 pCi/L of Tc-99. The treated groundwater is released through KPDES-permitted Outfall 001. Radiological emissions from this facility are discussed in Chapter 4.

Northeast Plume Containment System

The IRA of the Northeast Plume was documented in a ROD signed by DOE and EPA in June 1995. The KDEP accepted the ROD. The NEPCS, an interim action, is designed to reduce off-site migration of the high concentration portions of TCE in the Northeast Plume. The NEPCS consists of two extraction wells, an equalization tank, a transfer pump, a transfer pipeline, and instrumentation and controls. Characterization and construction activities were completed in December 1996. System start-up and operational testing were conducted, and full operation began in February 1997.

System operation includes pumping groundwater contaminated with TCE from two extraction wells to the equalization tank. A transfer pump is used to pump the contaminated water from the equalization tank through a transfer pipeline (approximately 6,000 linear ft) to the top of the C-637-2A or C-637-2B Cooling Tower. C-637-2A is the primary destination; however, if C-637-2A is off-line, flow is transferred to the C-637-2B tower. The cooling tower acts as an air stripper and removes the TCE from the groundwater as it moves through the tower.

Through 2012, over 1,304 million gal of contaminated groundwater had been extracted and treated by the NEPCS. Through the end of 2012, a total of 3,391 lb of TCE has been removed from the groundwater by the NEPCS. One indicator of progress for the groundwater cleanup is the reduction of concentrations of TCE in the groundwater in the Northeast Plume. Influent was near 2,000 µg/L in 1997 and has declined to 200 µg/L and less in 2012.

Surface Water Operable Unit (Off-Site)

The *Work Plan for the Surface Water Operable Unit Remedial Investigation/Feasibility Study at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* (DOE 2011a) was approved by Kentucky and EPA on June 19, 2012, and June 27, 2012, respectively. The goals for the SWOU are consistent with those established in the FFA (EPA 1998) and the Paducah SMP negotiated among DOE, EPA, and Kentucky (DOE 2012a). The goals of this RI/FS are as follows:

Goal 1: Characterize Nature of Contamination—characterize the nature of contaminants using existing data and, if required, by collecting additional data;

Goal 2: Define Extent of Contamination in Soil and Sediment—define the extent (vertical and lateral) and magnitude of contamination and perform an evaluation of sediment, soils, surface water, and ecological receptors to ensure that all exposure pathways for the subject units are assessed adequately to support cleanup decisions;

Goal 3: Determine Transport Mechanisms and Pathways—gather existing data and, if necessary, collect additional data to analyze contaminant transport mechanisms;

Goal 4: Complete a baseline human health risk assessment and screening-level ecological risk assessment for each investigation area;

Goal 5: Complete a sitewide baseline ecological risk assessment; and

Goal 6: Complete an Evaluation of Remedial Alternatives—determine if the existing data are sufficient to evaluate alternatives that will reduce risk to human health and the environment and support a no further action (NFA).

The SWOU includes the soils/sediments and storm water corresponding with the points of discharge from facility piping to ditches, outfalls, and Bayou and Little Bayou Creeks. Due to programmatic reprioritization, the RI is planned for 2027.

Soils Operable Unit Investigation

An investigation was performed from in 2010 that focused on collecting field and analytical data necessary to determine the nature and extent of any soil contamination originating from the 86 SWMUs under the Soils OU; support the completion of a Baseline Human Health Risk Assessment (BHHRA) and Screening Ecological Risk Assessment (SERA); and evaluate appropriate remedial alternatives (if necessary) at each of the SWMUs. The D1 *Soils Operable Unit Remedial Investigation Report at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, was issued to the regulators on July 19, 2011 (DOE 2011b). In order to address concerns from the regulators for adequate characterization, 50 of the 86 SWMUs under the Soils OU were characterized, and the results were reported in a revised RI Report (DOE 2012d). This D2 report, *Soils Operable Unit Remedial Investigation Report at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, was issued to the regulators on October 1, 2012 (DOE 2012d). Of the remaining SWMUs not included in this report, 20 SWMUs (including 1 SWMU divided into 2 portions) were deferred to the Soils and Slabs OU, 16 SWMUs were determined to require additional characterization to delineate the extent of contamination and will be further investigated in a subsequent RI, and 1 SWMU was granted an NFA status based on a previous removal action and the change was documented in a revised SWMU Assessment Report. Due to programmatic reprioritization, the subsequent RI is planned for 2024.

Burial Grounds Operable Unit Remedial Investigations and Feasibility Studies

The BGOU consists of 10 SWMUs. The *Work Plan for the Burial Grounds Operable Unit Remedial Investigation/Feasibility Study at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, (DOE 2006b) was approved by the regulators in November 2006. The goals for the BGOU are consistent with those established in the FFA (EPA 1998) and the Paducah SMP (DOE 2012a) negotiated among DOE, EPA, and the KDEP.

An investigation was performed from January through May 2007 that focused on collecting field and analytical data necessary to determine the nature and extent of any soil and groundwater contamination originating from and immediately under the burial cells; support the completion of a BHHRA and SERA; and evaluate appropriate remedial alternatives (if necessary) at each of the SWMUs. To address the goals presented above, an RI (Goals 1 through 3) and an FS (Goal 4) were developed: *Remedial Investigation*

Report for the Burial Grounds Operable Unit (DOE 2010a) and *Feasibility Study for the Burial Grounds Operable Unit* (DOE 2010b). The RI Report has been approved by KDEP and EPA.

The 2010 *Feasibility Study for the Burial Grounds Operable Unit* addressed SWMUs 2, 3, 4, 5, 6, 7, and 30. In September 2011, the FFA parties agreed that this FS should be replaced by three separate FSs: one for SWMUs 5 and 6; a second for SWMUs 2, 3, 7, and 30; and a third for SWMU 4. A supplemental RI and the associated RI Report Addendum will be conducted for SWMUs 9, 10, and 145, followed by a fourth FS.

A revised D2 *Feasibility Study for Solid Waste Management Units 5 and 6 of the Burial Grounds Operable Unit at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, (DOE 2012e) was submitted to the regulators on August 6, 2012.

The D1 *Feasibility Study for Solid Waste Management Units 2, 3, 7, and 30 of the Burial Grounds Operable Unit at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, (DOE 2012f) was submitted to the regulators on April 30, 2012.

Additional characterization is being conducted at SWMU 4 to address a number of existing data gaps. The *Addendum to the Work Plan for the Burial Grounds Operable Unit Remedial Investigation/Feasibility Study at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, Solid Waste Management Unit 4 Sampling and Analysis Plan*, (DOE 2012g) was approved by the regulators in July 2012, and sampling began in September 2012. The investigation is being conducted in five phases; the fifth phase will be completed in 2014.

Waste Disposal Alternatives Remedial Investigation and Feasibility Study

The purpose of the Waste Disposal Alternatives project is to evaluate waste disposal alternatives for CERCLA waste that will be generated from environmental restoration of OUs and from future D&D activities at PGDP. Various hazardous, nonhazardous, and low-level radioactive wastes resulting from past and ongoing operations has been generated and disposed of at PGDP.

Site cleanup activities are expected to generate a variety of CERCLA waste, totaling an estimated 3.6 million yd^3 (mcy) from 2014 to 2039.[9] Waste types are anticipated to include the following:

- LLW (defined in the Atomic Energy Act)
- Hazardous waste (defined in *KRS* 224 and RCRA Subtitle C)
- Mixed LLW (MLLW) (defined and regulated as a hazardous waste and LLW)
- TSCA waste (defined and regulated as a TSCA waste)
- TSCA/LLW waste (defined and regulated as a TSCA waste and LLW)
- Nonhazardous solid waste (defined by RCRA Subtitle D and meets the waste acceptance criteria of the on-site C-746-U Landfill)

[9] A potential waste disposal cell for CERCLA waste is not projected to be operational until 2018.

An RI/FS scoping document was prepared in April 2008 (DOE 2008a). The purpose of the scoping document was to lay the groundwork for the RI/FS process and specifically to facilitate the development of the RI/FS Work Plan. The *Work Plan for CERCLA Waste Disposal Alternatives Evaluation Remedial Investigation/Feasibility Study at the Paducah Gaseous Diffusion Plan, Paducah, Kentucky*, was approved by KDEP and EPA in September 2011 (DOE 2011c). The D1 RI/FS Report, *Remedial Investigation/Feasibility Study Report for CERCLA Waste Disposal Alternatives Evaluation at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, was submitted to the regulators on May 8, 2012.

3.4 WASTE DISPOSITION PROGRAM

The Paducah Site Waste Disposition Program directs the safe treatment, storage, and disposal of waste from current DOE activities. Waste managed under the program is divided into the following eight categories.

(1) *Hazardous waste*—Waste that contains one or more of the wastes listed as hazardous under RCRA or that exhibits one or more of the four RCRA hazardous characteristics: (1) ignitability, (2) corrosivity, (3) reactivity, and (4) toxicity.

(2) *Mixed waste*—Waste containing both a hazardous component regulated under RCRA and a radioactive component regulated under the Atomic Energy Act.

(3) *Transuranic waste*—Waste that contains more than 100 nanocuries of alpha emitting transuranic isotopes per gram of waste, with half-lives greater than 20 years.

(4) *Low-level radioactive waste*—Radioactive waste not classified as high-level or transuranic.

(5) *PCB-containing and PCB-contaminated waste*—Waste containing or contaminated with PCBs.

(6) *Asbestos waste*—Asbestos-containing materials from renovation and demolition activities.

(7) *Solid waste*—Solid sanitary/industrial waste basically is refuse or industrial/construction debris and is disposed of in landfills.

(8) *PCB radioactive waste*—PCB waste or PCB items mixed with radioactive materials.

In addition to compliance with current regulations, DOE supplemental policies are enacted for management of radioactive, hazardous, PCB, PCB/radioactive, and mixed wastes. These policies include reducing the amount of wastes generated; characterizing and certifying waste before it is stored, processed, treated, or disposed of; and pursuing volume reduction and use of on-site storage, if safe and cost-effective, until a final disposal option is identified. In 2012, waste disposition activities varied, but were focused on completion of disposal of waste from D&D of the C-340 Building and C-410 Complex.

The Waste Information Tracking System (WITS) at PGDP records that approximately 3 million ft^3 of waste has been dispositioned to date. In 2012, approximately 43,600 ft^3 of waste was shipped off-site for treatment, disposal, and/or recycling (not including office waste), and approximately 58,700 ft^3 of waste was taken to the on-site C-746-U Landfill.

Waste Minimization/Pollution Prevention

The Waste Minimization/Pollution Prevention (WM/PP) Program at the Paducah Site provides guidance and objectives for minimizing waste generation. The program is set up to comply with RCRA and the Pollution Prevention Act, as well as applicable Commonwealth of Kentucky and EPA rules, DOE Orders, EOs, and the STP. All PGDP projects are evaluated for WM/PP opportunities.

The program strives to minimize waste using the following strategies: source reduction, segregation, reuse of materials, recycling, and procurement of recycled-content products.

The program has the following goals and objectives:

- Eliminate or reduce the amount and toxicity of all waste generated at the site;
- Comply with federal and state regulations and DOE requirements for waste minimization;
- Reuse or recycle materials when possible;
- Identify waste reduction opportunities;
- Integrate WM/PP technologies into ongoing projects;
- Coordinate recycling programs; and
- Track and report results.

Accomplishments of the WM/PP Program in 2012 include the following:

(1) Placed emphasis on using and/or recycling by-products.

(2) Drained filters, reused any gasoline products, and recycled oil.

(3) Handled light bulbs as universal waste and recycled them.

(4) Purchased green tip (low mercury) bulbs.

(5) Continued to review purchases for substitute products with lesser hazard concerns and maintained a minimum quantity of material on hand.

(6) Continued to reduce the amount of radioactive waste by the "Clean is Green" concept that is encouraged by DOE.

(7) Verified recyclables to be free of radiological contamination prior to off-site release.

(8) Diverted approximately 45 metric tons (99,000 lb) of materials from disposal for FY 2012.[10] Materials recycled included paper, cardboard, batteries, scrap metal (nonradiological), tires, toner cartridges, wood pallets, oils, antifreeze, and fluorescent bulbs.

Depleted Uranium Hexafluoride Cylinder Program

A product of the UE process, DUF_6 is a solid at ambient temperatures and is stored in large metal cylinders. At the end of 2012, the Paducah Site managed an inventory of approximately 46,000 cylinders

[10] WM/PP for the site is reported using DOE's Pollution Prevention Tracking and Reporting System (PPTRS). PPTRS is reported on an FY basis.

stored in outdoor facilities, commonly referred to as cylinder storage yards. The inventory varies from time to time, as a result of DOE agreements to receive or market DUF_6.

Stored as a crystalline solid at less than atmospheric pressure, when DUF_6 is exposed to moisture in the atmosphere, HF and uranyl fluoride form. The uranium by-products form a hard crystalline solid that acts as a self-sealant within the storage cylinder. The acute hazard potential of DUF_6 primarily is chemical toxicity from any released HF.

The mission of the DUF_6 Cylinder Program is to safely store the DOE-owned DUF_6 inventory until its ultimate disposition. DOE has an active cylinder management program that includes cylinder and cylinder yard maintenance, routine inspections, and other programmatic activities such as cylinder corrosion studies. The program maintains a cylinder inventory database that serves as a systematic repository for all cylinder inspection data.

On April 15, 1999, DOE issued the *Final Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride* (DOE 1999). In 2002, DOE selected Uranium Disposition Services, LLC, (UDS) to design, build, and operate facilities at Paducah, Kentucky, and Portsmouth, Ohio. The facilities would convert the inventory of DUF_6 to triuranium octaoxide (U_3O_8), a more stable form of uranium that is suitable for disposal or reuse, and hydrofluoric acid that will be sold for commercial use.

Consistent with Public Law 107-206, construction began in July 2004 and continued through 2008. Physical construction of the facility was completed on December 19, 2008. Following systems testing and thorough readiness reviews, operational readiness was conducted in 2010. On March 29, 2011, the contract transitioned from UDS to BWCS. BWCS announced full operational status in September 2011. During 2012, BWCS converted approximately 4,517 metric tons of DUF_6 to a more stable oxide and aqueous hydrogen fluoride.

3.5 DECONTAMINATION AND DECOMMISSIONING

D&D is conducted for inactive facilities and other structures contaminated with radiological and hazardous material. Facilities are accepted for D&D when they no longer are required to fulfill a site mission. Thirty-seven facilities were targeted for D&D by DOE. By the end of CY 2012, demolition was completed to slab for 30 of those facilities. The remaining facilities include C-410 Feed Plant and C-340 Metals Reduction Plant. The C-340 Metals Reduction Plant complex converted UF_6 to uranium metal and HF, and the C-410 UF_6 Feed Plant complex converted U_3O_8 to UF_6. Contaminants at these facilities include depleted uranium, natural uranium, transuranic radionuclides, uranium tetrafluoride, PCBs, asbestos, and lead paint.

Removal of the C-410 Complex infrastructure is being completed as a CERCLA non-time-critical removal action. In 2009 and 2010, the C-410 AM and Remedial Action Work Plan were modified via an addendum to include building demolition as the selected response action. Elevated levels of plutonium were found in the C-410 Complex (D&D) Project during the months of January and February 2012. The UF_6 piping that contained this material was removed during 2012.

American Recovery and Reinvestment Act (ARRA) funds utilized at the Paducah Site from 2009 to 2011 were used to remove and dispose of large process equipment and demolish surplus chemical processing facilities, shrinking the area of contamination. ARRA funding for Paducah totaled approximately $78.8 million to accelerate the current D&D Program for three facilities. The three facilities are as follows:

- C-340-D and C-340-E (demolition to slab and prepare C-340-A, -B, and -C for demolition)
- C-746-A East End Smelter (demolition and debris removal)
- C-410 Feed Plant Complex (prepare for slab demolition and partial demolition of the C-410 Complex)

The following are significant D&D accomplishments in 2012:

- Continued deactivation of C-410 Building and completed deactivation of C-340 Building.
- Completed stabilization and removal of 9,000 linear ft of UF_6 piping in the C-410 Complex.
- Completed stabilization of 8 UF_6 production reactors and filters, 24 UF_6 ash receivers, the 1,000 gal UF_6 surge tank, and over 1,800 ft of ash conveyor used in the UF_6 production system.
- Continued asbestos abatement in the C-410 Complex.
- Initiated and completed transite removal from the C-340 Complex.
- Mobilized subcontractor and initiated structural demolition of the C-340 Complex (see Figure 3.4).
- Completed over 50% of C-340 Building demolition in 2012.
- Packaged over 700 tons of PCB remediation debris in gondolas from C-340 D&D for off-site shipment.
- Dispositioned over 700 tons of demolition debris from C-340 D&D in the C-746-U Landfill.

Figure 3.4. C-340 Building Demolition

3.6 AWARDS AND RECOGNITION

In 2012, PGDP was recognized with its fourth silver level Federal Electronics Challenge award in 5 years. SST earned a DOE Green Buy Bronze Award. BWCS received the National Safety Council Perfect Record Award and Million Work Hours Award for operating 2,422,875 employee hours without an occupational injury or illness involving days away from work. DOE's contractors LATA Kentucky, SST, and BWCS shared the Governor's Health and Safety Award, the highest safety honor given by the Commonwealth of Kentucky. LATA Kentucky also ranked first on the Environmental Management Prime Contractor Safety Ranking Scorecard across the DOE complex. The PGDP facility continues to seek additional recognition within the community through public awareness programs, community/educational outreach, the Citizens Advisory Board (CAB), publishing an End State Vision document, and the Environmental Information Center (EIC). Additional information regarding these programs follows.

Public Awareness Program

A comprehensive Community Relations and Public Participation Program exists for DOE activities at the Paducah Site. The purpose of the program is to provide the public with opportunities to become involved in decisions affecting environmental issues at the site.

Community/Educational Outreach

DOE and LATA Kentucky environmental communications and outreach supported several educational and community outreach activities during 2012. Some of these activities are described below.

DOE sponsored a two-day Commercial Industry Workshop in 2012. The workshop served as the first step in enabling DOE to learn of any commercial interest either in operating PGDP to continue enriching uranium or in utilizing all or part of the PGDP facilities for other commercial purposes, particularly for reuse/reindustrialization.

Three-dimensional models developed by University of Kentucky College of Design students, through the Kentucky Research Consortium for Energy and Environment at the University of Kentucky Center for Applied Energy Research, showing groundwater cleanup progress at the Paducah Site were displayed at West Kentucky Community and Technical College's Emerging Technology Center. The exhibit (see Figure 3.5) modeled the difficulty and complexity of groundwater cleanup. Additional information about the models can be found at http://www.research.uky.edu/reveal/paducah.shtml.

DOE partnered with the PGDP CAB to sponsor the third annual Eco Fair for area middle school students, which was held at WKWMA. This year's primary focus at the Eco Fair was recycling. Students also learned about the history of PGDP and DOE's efforts in environmental cleanup. Together with the University of Kentucky-Paducah Campus, West Kentucky Community and Technical College, and the Paducah Area Chamber of Commerce's Business Education Partnership, DOE cosponsored the Western Kentucky Regional Science Bowl for area high schools and middle schools. A summer intern program for area college students and a mentoring program for area middle school students also were provided by LATA Kentucky.

Citizens Advisory Board

The PGDP CAB, a site-specific advisory board chartered by DOE under the Federal Advisory Committees Act, completed its sixteenth full year of operation in September 2012. During the calendar

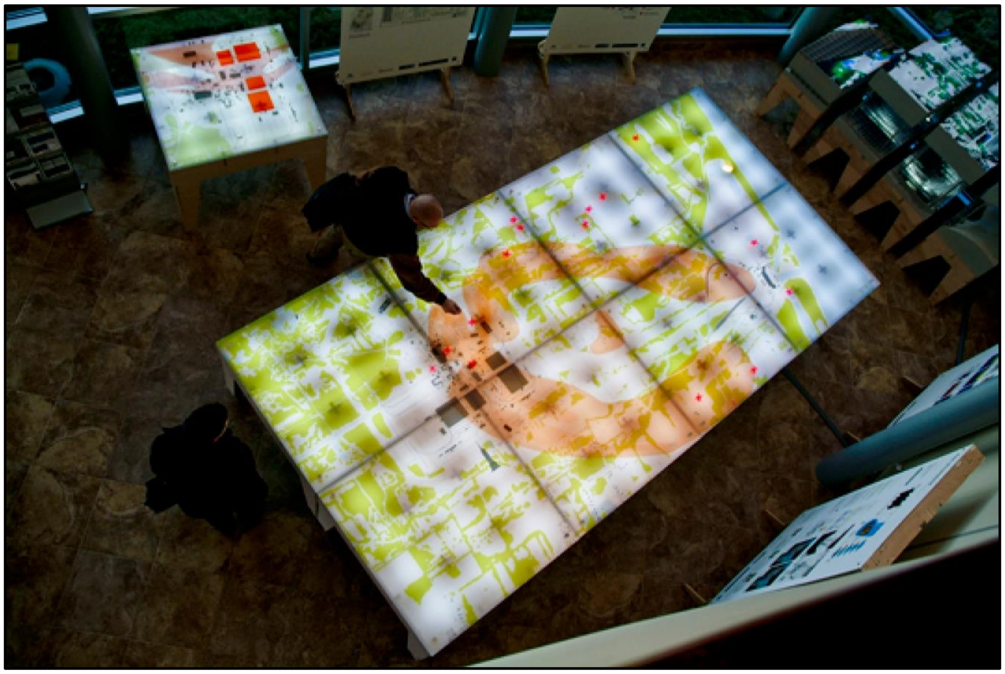

Figure 3.5. Three-Dimensional Groundwater Models Developed by University of Kentucky College of Design

year, the CAB held 5 regular board meetings and 21 subcommittee meetings. The PGDP CAB also hosted a 2-day national CAB chairs meeting and tour of PGDP.

The CAB includes six active committees, which meet as necessary. The committees review issues for the following areas:

- Burial Grounds
- Waste Disposal Options
- Historical Preservation
- Integrated Priority List
- Groundwater
- Future Use/Adaptive Reuse

All meetings are open to the public and all regular board meetings are publicly advertised. In addition to its voting members, the CAB also has liaison members representing DOE, EPA Region 4, KDWM, Kentucky Cabinet for Health and Family Services, and WKWMA.

The CAB is composed of up to 18 members, chosen to reflect the diversity of gender, race, occupation, views, and interests of persons living near the PGDP. The CAB is committed to reflecting the concerns of the communities impacted by environmental management of the plant site. It meets bimonthly to focus on early citizen participation in environmental cleanup priorities and related issues at the DOE facility. Additional information concerning the CAB may be obtained at www.pgdpcab.energy.gov.

End State Vision Document

The End State Vision Process for PGDP was initiated in 2004. The End State Vision Document was developed and issued in August 2005 as a planning tool for the site's future use. This process identifies the condition of the property after cleanup that would be protective of human health and the environment, while taking into account the future use of the property (e.g., industrial, recreational, or residential) and any potential contaminants and hazards. The process also identifies any variances between the currently planned end state and the potential alternative end state. The most recent version of this document was issued in 2008 (DOE 2008b). The process to update and revise the document will be evaluated in 2013 to determine if cessation of operations of the GDP, which currently is operated by USEC, affects the planned end state and the potential alternative end state.

Environmental Information Center

The public has access to Administrative Records and programmatic documents at the DOE EIC in the Barkley Centre, 115 Memorial Drive, Paducah, Kentucky. The EIC is open Monday through Friday from 8 a.m. to 12 p.m. and by appointment. The EIC's phone number is (270) 554-3004.

Documents for public comment also are placed in the McCracken County Public Library (formerly the Paducah Public Library), 555 Washington Street, Paducah, Kentucky. The library is open Monday through Thursday from 9 a.m. to 9 p.m., Friday through Saturday from 9 a.m. to 6 p.m., and Sunday from 1 p.m. to 6 p.m.

In 2012, an enhanced geospatial mapping tool provided public access via the Internet to environmental sampling data at the Paducah site. The PEGASIS implementation project consists of an external geographic information system and analytical data viewer that allows regulatory agencies and the general public to view Paducah Site data previously attainable only through a formal Freedom of Information Act request. PEGASIS is an acronym for the Lexington-based DOE PPPO's Environmental Geographic Analytical Spatial Information System. The Kentucky Research Consortium for Energy and Environment pioneered the Paducah Data Warehouse system several years ago for the Paducah site. Questions and comments about PEGASIS can be sent to PEGASISAdmin-PAD@lataky.com.

The EIC and other public Web pages related to DOE work at the PGDP can be accessed at www.pppo.energy.gov/pad_eic.html and www.paducaheic.com.

4. ENVIRONMENTAL RADIOLOGICAL PROTECTION PROGRAM AND DOSE ASSESSMENT

Releases to the atmosphere from the NWPGS, NEPCS, and DUF_6 conversion operations were estimated for 2012. The calculated emissions for each activity were less than the 40 CFR § 61, Subpart H, limit of 0.1 millirem (mrem) dose to the maximally exposed individual.

Analyses of samples of liquid effluents from PGDP indicate that detectable levels of uranium and Tc-99 are at levels that are protective of human health.

4.1 INTRODUCTION

Some materials, like uranium that consists of radioisotopes such as uranium-234 (U-234), uranium-235 (U-235), and uranium-238 (U-238), are radioactive and give off radiation when the nucleus breaks down or disintegrates. Three kinds of radiation generated by radioactive materials or sources are alpha particles, beta particles, and gamma rays. When ionizing radiation interacts with the human body, it gives its energy to the body tissues. The amount of energy absorbed per unit weight of the organ or tissue is called absorbed dose. Many radiation sources are naturally occurring and are considered natural sources (e.g., sun, earth) (NCRP 2009). The body absorbs the radiation from these natural sources, as well as sources that are not naturally occurring. Radioactivity can be measured in differing units (e.g., becquerel, curies). Historical data sets exist for those radionuclides that are known to be present, either now or in the past. Following is a listing of plant process-related radionuclides and radionuclides associated with recycled uranium:

- Uranium-234
- Uranium-235
- Uranium-238
- Technetium-99
- Thorium-230
- Thorium-234
- Neptunium-237
- Plutonium-238
- Plutonium-239
- Americium-241
- Cesium-137

The monitoring program for radioactivity in liquid and airborne effluents is described fully in Paducah Site EMPs. Radioactivity in liquid effluent is monitored through the implementation of KPDES compliance monitoring. Radiological monitoring from surface water and sediment locations was removed in the 2011 EMP and remained the same in the 2012 EMP. The reduction in sampling was based on a thorough analysis of historical radiological results in comparison to DOE standards. Historically, the maximum radiological dose to an individual from surface water and sediment exposure contributions to the potential dose to the public was less than 0.4 mrem each, which is significantly less than the 100 mrem allowed by DOE Order 458.1. Additionally, no anticipated change in conditions existed based on site operations.

4.2 RADIOLOGICAL EFFLUENT MONITORING

Airborne Effluents

In accordance with DOE Order 450.1A, effluent monitoring is conducted as part of the EMS. DOE Order 458.1, *Radiation Protection of the Public and the Environment*, sets dose limits for members of the public at 100 mrem per year through all exposure pathways resulting from routine DOE operations with the dose being as low as reasonably achievable (ALARA).

Radiological airborne releases from DOE facilities also are regulated under 40 *CFR* § 61, Subpart H, which governs radionuclide emissions, other than radon. Per the regulations, emissions of radionuclides to ambient air from DOE facilities shall not exceed an effective dose equivalent of 10 mrem/year to any member of the public. The dose equivalent is based on a potential exposure to a hypothetical resident who has the greatest chance of being affected by a release of airborne contaminants, also known as the maximally exposed individual.

DOE sources listed in Table 4.1 released airborne radionuclides in 2012. Airborne radionuclides were also released from fugitive sources. The total release of airborne radionuclide was monitored by an ambient air monitoring network as discussed in Section 4.4. A complete summary of this emissions data can be found in the *National Emissions Standard for Hazardous Air Pollutants Annual Report for 2012* (LATA Kentucky 2013b).

The total 2012 dose equivalent resulting from both DOE and USEC emissions was 0.0047 mrem. This is well below the annual limit of 10 mrem per year. The DOE emissions contribution to this total was 0.000022 mrem. Dose calculations for these atmospheric releases are discussed in Section 4.4 of the ASER. The estimated amounts of radionuclides releases in summarized in Table 4.1.

Table 4.1. PGDP Radionuclide Atmospheric Releases for CY 2012 (in Curies)

Nuclide	Northwest Plume Treatment Facility	Northeast Plume Treatment Facility	DUF_6 Conversion Facility	Total Including USEC Operations
U-234	0	0	2.19E-07	2.62E-03
U-235	0	0	1.00E-08	9.09E-05
U-238	0	0	5.36E-07	3.25E-04
Tc-99	1.32E-04	5.93E-06	0	2.97E-03
Th-230	0	0	0	1.40E-05
Th-231	0	0	3.68E-08	3.68E-08
Th-234	0	0	3.36E-06	3.36E-06
Np-237	0	0	0	8.51E-05
Pu-239	0	0	0	1.43E-06
Pa-234m	0	0	3.36E-06	3.36E-06
Total Curies/Year	**1.32E-04**	**5.93E-06**	**7.52E-06**	**6.11E-03**

Northwest Plume Groundwater System

The CERCLA IRA ROD, signed July 22, 1993, established the NWPGS. Although administrative requirements (e.g., permits) of environmental regulations do not apply to projects conducted under CERCLA, DOE has continued to provide pertinent information about emissions to the regulators. The NWPGS Operations and Maintenance Plan describes sampling and methodologies to be used at the

NWPGS. The air emissions methodology is to estimate air emissions based on influent water sample results. The analysis of the air stripper influent water provides a more accurate measurement of airborne discharges than actual stack measurements due to the low, practically immeasurable, radionuclide airborne effluents associated with the facility. This method of estimating emissions is allowed by 40 *CFR* § 61.

On August 28, 1995, DOE began operation of the NWPGS. The facility is located just outside the northwest corner of the PGDP security area. The facility consists of an air stripper to remove VOCs and an ion exchange unit for the removal of Tc-99 from water. The air stripper is located upstream of the ion exchange unit. The Tc-99 concentration in the influent water of the air stripper and the quantity of the water passing through the air stripper were used to calculate total potential Tc-99 emissions from the facility in 2012. The emissions were used to calculate dose rates associated with this operation. Releases in 2012 to the atmosphere from the NWPGS were estimated to be 1.32E-04 curies (Ci) of Tc-99.

Northeast Plume Containment System

The NEPCS is a CERCLA interim action to remediate contaminated groundwater. Although administrative requirements (e.g., permits) of environmental regulations do not apply to projects conducted under CERCLA, DOE has continued to provide pertinent information about emissions to the regulators. In 2012, Tc-99 was detected in low concentrations in the groundwater that was extracted.

The wells and pumping facility are located northeast of the PGDP security area. The water is pumped to the C-637-A Cooling Tower where the contaminants evaporate from the extracted groundwater. The Tc-99 concentration and the quantity of the water pumped to the cooling tower were used to calculate total potential Tc-99 emissions from the facility in 2012. This method of estimating emissions is allowed by 40 *CFR* § 61. The estimated emissions from the NEPCS were estimated to be 5.93E-06 Ci of Tc-99.

Depleted Uranium Hexafluoride Conversion Facility

The DUF_6 Conversion Facility produces uranium oxide dust that is primarily in the form of U_3O_8 for use, storage, and/or disposal. Multiple prefilters and primary HEPA filter banks within the facility heating, ventilation, and air-conditioning system control particulate emissions of oxide powder. Prior to atmospheric venting of process off-gas through the stack, air passes through a secondary set of HEPA filter banks. The conversion building is maintained at negative pressure to help eliminate the possibility of fugitive emissions. Stack monitoring results were used to estimate emissions associated with this operation in 2012; releases to the atmosphere from the conversion facility were estimated to be 7.52E-06 Ci.

Liquid Effluents

The KPDES permit requires grab samples and composite samples collected at weekly, monthly, or quarterly monitoring frequencies are used to measure discharges for nonradiological and radiological parameters. The monitoring results are reported monthly and/or quarterly. The KPDES permit only imposes enforceable limits on some of the nonradiological parameters. Figure 4.1 illustrates KPDES outfalls and landfill surface water monitoring locations.

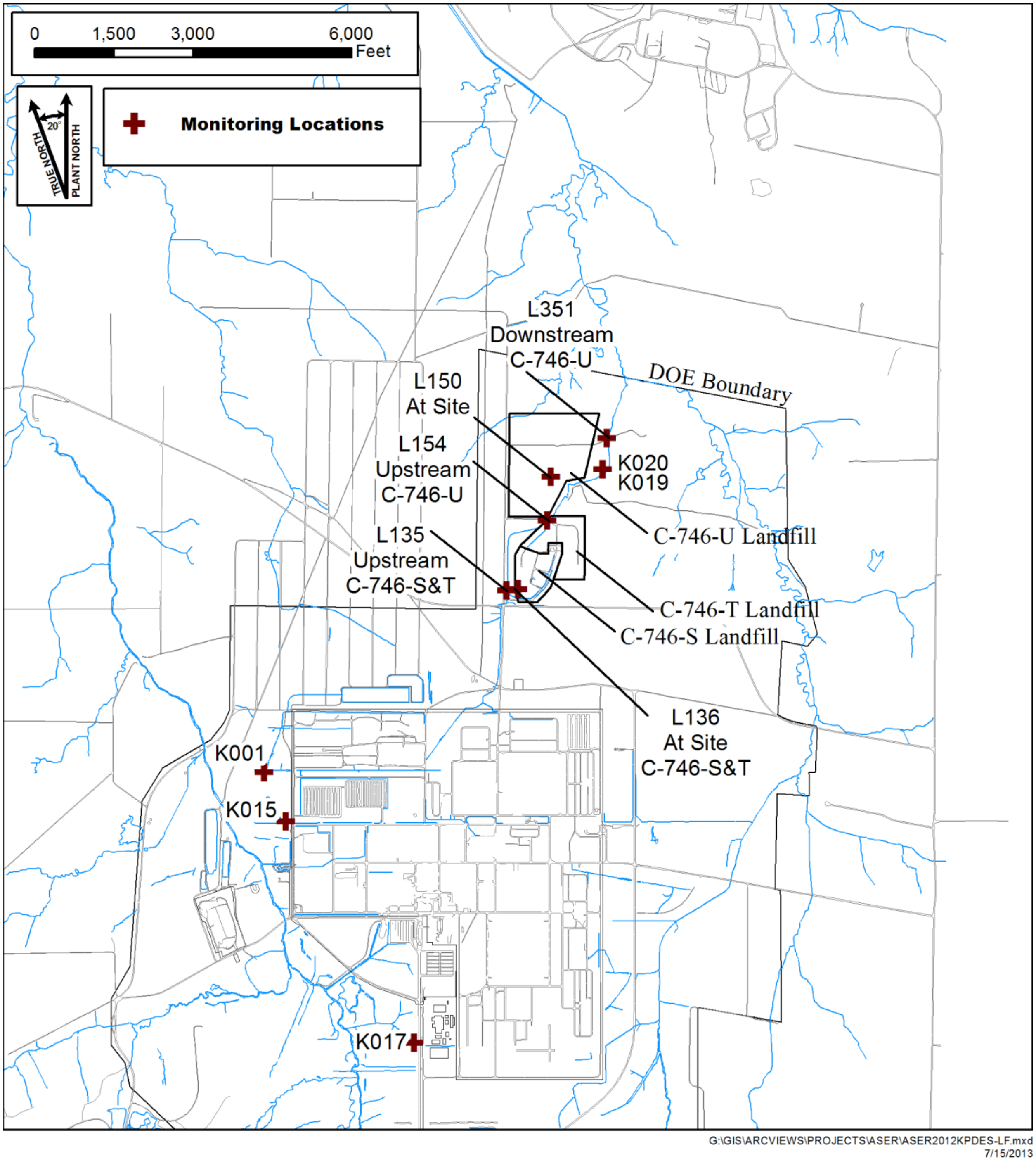

Figure 4.1. KPDES Outfalls and Landfill Surface Water Monitoring Locations

DOE Orders 450.1A and 458.1 establish effluent monitoring requirements to provide confidence that radiation exposure limits of 100 mrem per year are not exceeded. DOE Order 458.1 sets guidelines for allowable concentrations of radionuclides in various effluents to protect public health and requires radiological monitoring. Because sampling was still under DOE Order 5400.5 in 2012, this protection was achieved at the Paducah Site by meeting derived concentration guides (DCGs), which are the concentrations of given radionuclides that would result in an effective dose equivalent of 100 mrem per year. Beginning in 2013, this protection will be achieved at the Paducah Site by meeting derived concentration technical standards (DCSs), which are the derived concentration value for a radionuclide in water that would result in a dose of 100 mrem in a year to a gender- and age-weighted reference person using DOE-approved dose conversion factors and assuming continuous exposure. The DCGs and DCSs are based on the assumption that a member of the public has continuous, direct access to the liquid effluents. In reality, exposure is not continuous; therefore, the allowable concentrations for the DCGs and DCSs are very conservative. Further information on DCGs and DCSs is provided in Appendix B.

Other radiological effluent monitoring is required by KDWM landfill permits SW07300014, SW07300015, and SW07300045 for the C-746-S, C-746-T, and C-746-U Landfills, respectively. Surface runoff is analyzed to determine if landfill constituents are being discharged into nearby receiving streams. Tables 4.2 and 4.3 present the radiological materials possible in liquid effluent releases in 2012. The total converted maximum uranium activity was 81 pCi/L or approximately one-fourth of the DCG considered to be protective of the public. Similarly, for Tc-99, the maximum at the outfalls was 19.7 pCi/L compared to the DCG of 100,000 pCi/L, which is considered to be protective of the public.

Table 4.2. Total Uranium Concentration in DOE Outfalls for CY 2012

Outfall	Number of Samples	Minimum Uranium (mg/L)	Average Uranium (mg/L)	Maximum Uranium (mg/L)	Converted Maximum Uranium Activity (pCi/L)[a,b]
001	54	ND	0.00619	0.0852	58
015	7	0.0272	0.0463	0.118	81
017	21	ND	0.00151	0.00389	3
019	1	ND	ND	ND	ND
020	13	0.00458	0.0155	0.0299	20

[a] DCG for uranium is 600 pCi/L (see Appendix B).
[b] Maximum uranium concentration was converted to an activity basis by assuming a natural isotopic distribution (99.3%, U-238; 0.71%, U-235; and 0.0054%, U-234).

Table 4.3. Tc-99 Activity in DOE Outfalls for CY 2012

Outfall	Number of Samples	Minimum (pCi/L)[a]	Average (pCi/L)[a]	Maximum (pCi/L)[a]
001	5	0.00[b]	3.79[c]	12.7[c]
015	3	3.69[c]	9.16[c]	18.5
017	5	0.00[b]	4.37[c]	8.47[c]
019	1	9.03[c]	9.03[c]	9.03[c]
020	5	4.8[c]	12.9[c]	19.7

[a] DCG for Tc-99 is 100,000 pCi/L (see Appendix B).
[b] Consistent with NRC guidance, 0.00 is presented for results reported less than zero.
[c] Results are reported at activities less than the laboratory's minimum detectable activity and/or radiological uncertainty. For the average, at least one result was reported at an activity less than the laboratory's minimum detectable activity.

Outfall 001 is a continuous flow outfall that receives discharges from a variety of permitted units, including the following:

(1) USEC's C-616 Liquid Pollution Abatement Facility (LPAF), a once-through cooling water system, 0.8 million gal per day (MGD);

(2) DOE's NWPGS, 0.3 MGD;

(3) DOE's waste management activities, including routinely generated C-404 treated leachate, C-733 and C-612-A sump water, and other waste management activities resulted in a cumulative discharge of approximately 40,000 gal; and

(4) DOE's discharge operations at the Northwest Stormwater Collection Basin (also referred to as the C-613 Sedimentation Basin).

DOE's NEPCS is treated through the C-637 Cooling Tower; the water from this is transferred to C-616 LPAF for air stripping. Next, the water is transferred by an underground pipeline to the C-616-F Full Flow Lagoon, and ultimately discharged into Outfall 001. In addition, surface water runoff is collected in the C-613 Sedimentation Basin and then discharged into Outfall 001. The C-613 Sedimentation Basin was designed to collect surface runoff from the scrap metal yards. The scrap metal has been removed from the yards; however, the basin remains in place and supports removal of suspended solids (i.e., sediments) from contaminated surface water runoff.

Outfall 015 receives surface-water runoff from the east-central sections of the plant. Outfall 017 receives surface-water runoff from the southeast section of the plant (primarily the cylinder storage yards). Outfall 019 receives surface-water runoff from C-746-U (DOE's operational nonhazardous, solid waste landfill) and Outfall 020 receives treated leachate from the C-746-S and C-746-U Landfills. Radiological effluent data from permitted outfalls are presented in Tables C.1.1 through C.1.5, of Appendix C of this report.

Landfill Surface Runoff

Surface runoff from the closed C-746-S Residential and C-746-T Inert Landfills is monitored quarterly. Due to their close proximity, the C-746-S&T Landfills are monitored as one landfill ("L" locations shown in Figure 4.1). Surface runoff also is monitored from the operating C-746-U Contained Landfill. Surface runoff from these landfills is monitored for gross alpha and gross beta concentrations. Grab samples are taken from the landfill runoff, the receiving ditch upstream of the runoff discharge point, and the receiving ditch downstream of the runoff discharge point. Sampling is performed to comply with the KDWM permit for landfill operations. Radiological sampling data for landfill surface runoff are presented in Tables C.1.6 through C.1.10, of Appendix C of this report.

Liquid Effluent Monitoring Results

Table 4.2 indicates the minimum, average, and maximum concentrations of uranium and maximum uranium activity concentrations discharged at each outfall monitoring location for CY 2012. A natural isotopic distribution was assumed during the conversion of uranium concentrations to uranium activities.

Table 4.3 indicates the minimum, average, and maximum Tc-99 activity concentrations discharged at each outfall monitoring location for CY 2012. These Tc-99 concentrations are well below the DCG of 100,000 pCi/L and, thus, protective of human health (see Appendix B).

4.3 RADIOLOGICAL ENVIRONMENTAL SURVEILLANCE

DOE Order 450.1A requires that by integrating the EMS into the ISMS, DOE elements must, as applicable, consider protection of biota. Both aquatic and terrestrial evaluations should be conducted. DOE Order 458.1 requires that populations of aquatic organisms and terrestrial plants be protected at a dose rate limit of 1 rad/day. A dose rate limit of 0.1 rad/day is recommended for terrestrial animals in the evaluation of the terrestrial systems.

The Radiological Environmental Surveillance Program at the Paducah Site is based on DOE Orders 450.1A, *Environmental Protection Program*, and 458.1, *Radiation Protection of the Public and the Environment.* These Orders require that an environmental surveillance program be established at all DOE sites to monitor the radiological effects, if any, of DOE activities on the surrounding population and environment. Surveillance includes analyses of surface water, groundwater (Chapter 6), sediment, terrestrial wildlife, direct radiation, and ambient air. Surveillance results from 2012 indicate that radionuclide concentrations in sampled media were within applicable DOE standards.

Ambient Air

In accordance with the 1993 DOE/USEC lease agreement, USEC is responsible for its radionuclide airborne point-source discharges at PGDP, while DOE is responsible for its own activities. During 2012, DOE activities with airborne point-source discharges at PGDP included the NWPGS, the NEPCS, and DUF_6 conversion activities. Using Kentucky Cabinet for Health and Family Services (KCHFS)-operated air monitors, DOE monitors fugitive emission sources such as building roof tops, piles of contaminated scrap metal, roads, concrete rubble piles, and the decontamination of machinery and equipment used in remediation activities.

The Radiation/Environmental Monitoring Section of the Radiation Health Branch of the KCHFS's Department for Public Health conducted ambient air monitoring during 2012. The Radiation Health Branch air monitoring network had 10 monitoring stations around the Paducah Site, as shown in Figure 4.2. In 2012, DOE began monitoring its own network of air monitors. DOE's air monitoring network has 9 monitoring stations. Both networks operated the last half of 2012. These air monitoring programs would detect emissions from all sources including fugitive emissions. The results of ambient air monitoring confirm that during 2012 the Paducah Site is in compliance with the regulatory standard for radioactive air emissions. The monitoring results for 2012 are listed in Appendix C, Tables C.2.1 through C.2.10 of this report.

Meteorological Monitoring

Computer-aided atmospheric-dispersion modeling uses emission and meteorological data to determine the impacts of plant operations to the community. Modeling is used at the Paducah Site to simulate the transport of air contaminants and predict the effects of abnormal airborne emissions from a given source. In addition, a multitude of emergency scenarios can be developed to estimate the effects of unplanned releases to employees and population centers downwind of the source. Historical meteorological monitoring data collected at the site, as well as regional National Weather Service meteorological monitoring data are used in the modeling analysis.

Monitoring Materials for Free Release

In order to ensure compliance with the requirements for unrestricted release found in DOE Order 458.1, Change 2, *Radiation Protection of the Public and the Environment*, a program has been established to

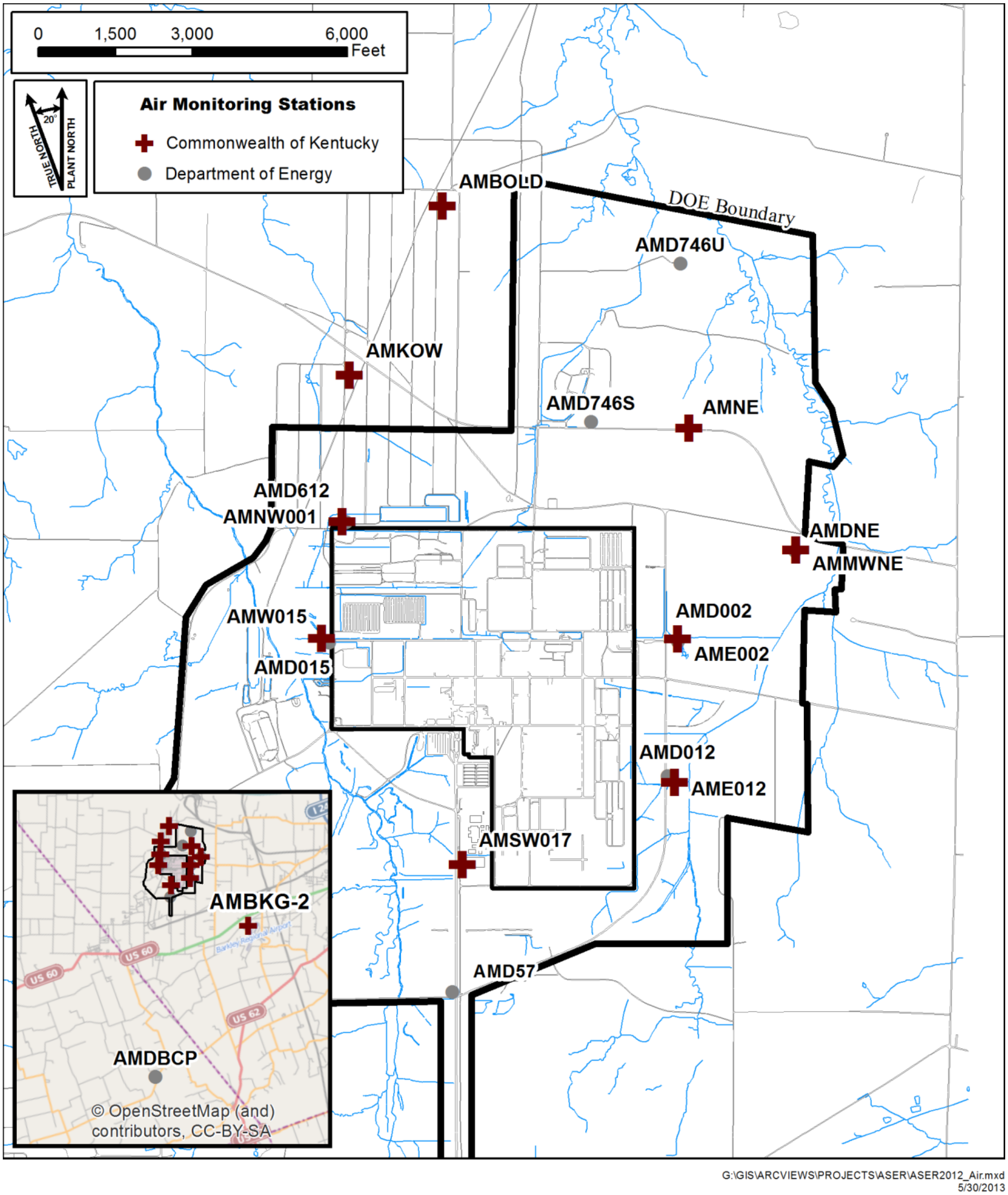

Figure 4.2. Paducah Site Ambient Air Monitoring Stations

regulate the release of materials from radiological and controlled areas. Materials with the potential for surface contamination are assessed by representatives from the radiological control organization to ensure that the material meets the limits established in the DOE Order. Depending on the type, volume, design of the material, and the intent of the release, the assessment may include a review of use history, radiological measurements of the surface radioactivity levels (e.g., surveys), and sampling of any internal fluids. Through careful application of this process, projects can release materials successfully from radiological and controlled areas for return to vendors, the public, or for reuse and recycle.

In 2011, BWCS began shipment of HF produced by the DUF_6 Conversion Facility, which converts DUF_6 into uranium oxide and HF. Each shipment must meet the release limit of less than 3 picocuries/milliliter (pCi/mL) of total uranium activity. BWCS shipped 827,329 gal of aqueous HF off-site during 2012. The total uranium activity of each shipment was less than 1.06 pCi/mL.

Surface Water

Paducah Site surface water runoff is released through plant outfalls either to the west in Bayou Creek or to the east in Little Bayou Creek. These merge north of the site and discharge into the Ohio River. The net impact of the Paducah Site on surface waters is evaluated by comparing data from samples collected upstream of the site to data from samples collected downstream of the site or from ecologically similar waterways that have not been impacted by PGDP activities. Bayou Creek and Little Bayou Creek are not used as drinking water supplies; therefore, EPA safe drinking water standards do not apply. Radioactive effluents from PGDP are managed in accordance with DOE Order 458.1.

In 2011, the radiological monitoring of surface water runoff, with the exception of permitted surface water samples, was discontinued due to historically low levels of radioactivity found within the samples, the lack of a viable mechanism to facilitate an increase in surface water radioactivity levels, and the resulting low doses that historically have been associated with surface water radioactivity. When compared to the applicable DCG, the average surface water sampling results from 2008–2010 have not exceeded 5.4% of the DCG. For 2012, the average result from 2008–2010 will be used to calculate individual doses associated with surface water runoff. Beginning in 2013, radiological monitoring of surface water will follow the approach set forth in the Environmental Radiation Protection Program developed as part of the implementation of DOE Order 458.1 from DOE Order 5400.5 (LATA Kentucky 2012b).

The radiological contaminants at Paducah Site primarily are uranium and Tc-99. Table 4.4 shows the radiological analytical parameters historically analyzed under the quarterly surveillance surface water sampling program.

Table 4.4. Historically Analyzed Radiological Parameters for Surface Water Samples

Parameter	
Americium-241	Potassium-40
Cesium-134	Technetium-99
Cesium-137	Thorium-228
Cobalt-60	Thorium-230
Dissolved Alpha	Thorium-232
Suspended Alpha	Thorium-234
Dissolved Beta	Uranium[a]
Suspended Beta	Uranium-234
Neptunium-237	Uranium-235
Plutonium-238	Uranium-235 Activity
Plutonium-239/240	Uranium-238

[a] Uranium was analyzed both as a metal (reported in mg/L) and as a radionuclide, calculated from the sum of the uranium isotopes (reported in pCi/L).

Figure 4.3 shows 20 historical surveillance surface water sampling locations. Radiological sampling was conducted at the following surface water sampling locations:

- Upstream Bayou Creek (L1);
- Bayou Creek near the plant site (C612, C616, K001UP, K015UP, S31, and L291);
- Downstream Bayou Creek (L5 and L6);
- Little Bayou Creek near the plant site (L10 and L194);
- Downstream Little Bayou Creek (L11, L12, and L241);
- Downstream Ohio River at the confluence with the Mississippi River (L306), which is the closest public drinking water supply intake point downstream of the plant;
- From the C-746-K Landfill (C-746K-5 and 746KTB1A);
- Upstream Ohio River (L29A);
- Downstream Ohio River (L30); and
- Background stream Massac Creek (L64).

No sample point exists for upstream Little Bayou Creek, because the flow in that part of the watershed is too low to monitor. Nearly all water in Little Bayou Creek is comprised of discharges from plant outfalls; therefore, reference water quality for Little Bayou Creek is based on Bayou Creek at station L1 (upstream Bayou Creek). Data from sampling locations L29A (Ohio River) and L64 (Massac Creek) also are used as references for water quality in comparison to Little Bayou Creek.

One seep location in Little Bayou Creek (LBCSP5) historically was sampled for radiological constituents during 2008–2010. Although there have been several locations sampled in the past, one location was chosen to sample each quarter to trend and observe changes in data; however, there have been instances when one of the seep locations could not be sampled due to high water levels at the sample point. The sampled seep (LBCSP5) is located downstream of the plant site approximately halfway between the site and the Ohio River (see Figure 4.3).

The surface water results are compared to the DCGs, which are the maximum levels that are considered protective of human health and the environment. These levels are described in Appendix B.

Surface Water Surveillance Results

Table 4.5 provides the average concentrations of radionuclides upstream and downstream of plant effluents in Bayou Creek, downstream of plant effluents in Little Bayou Creek; at the C-746-K Landfill; near the plant site in Bayou Creek and Little Bayou Creek; upstream and downstream in the Ohio River at the confluence of the Mississippi River (Cairo, Illinois); and at the reference stream, Massac Creek. The table reflects only radionuclide parameters in which at least one sampling location was reported at a concentration greater than the laboratory detection limit; therefore, not all parameters listed in Table 4.4 are cited in Table 4.5. Comparison of downstream data to upstream data and/or reference data is one of

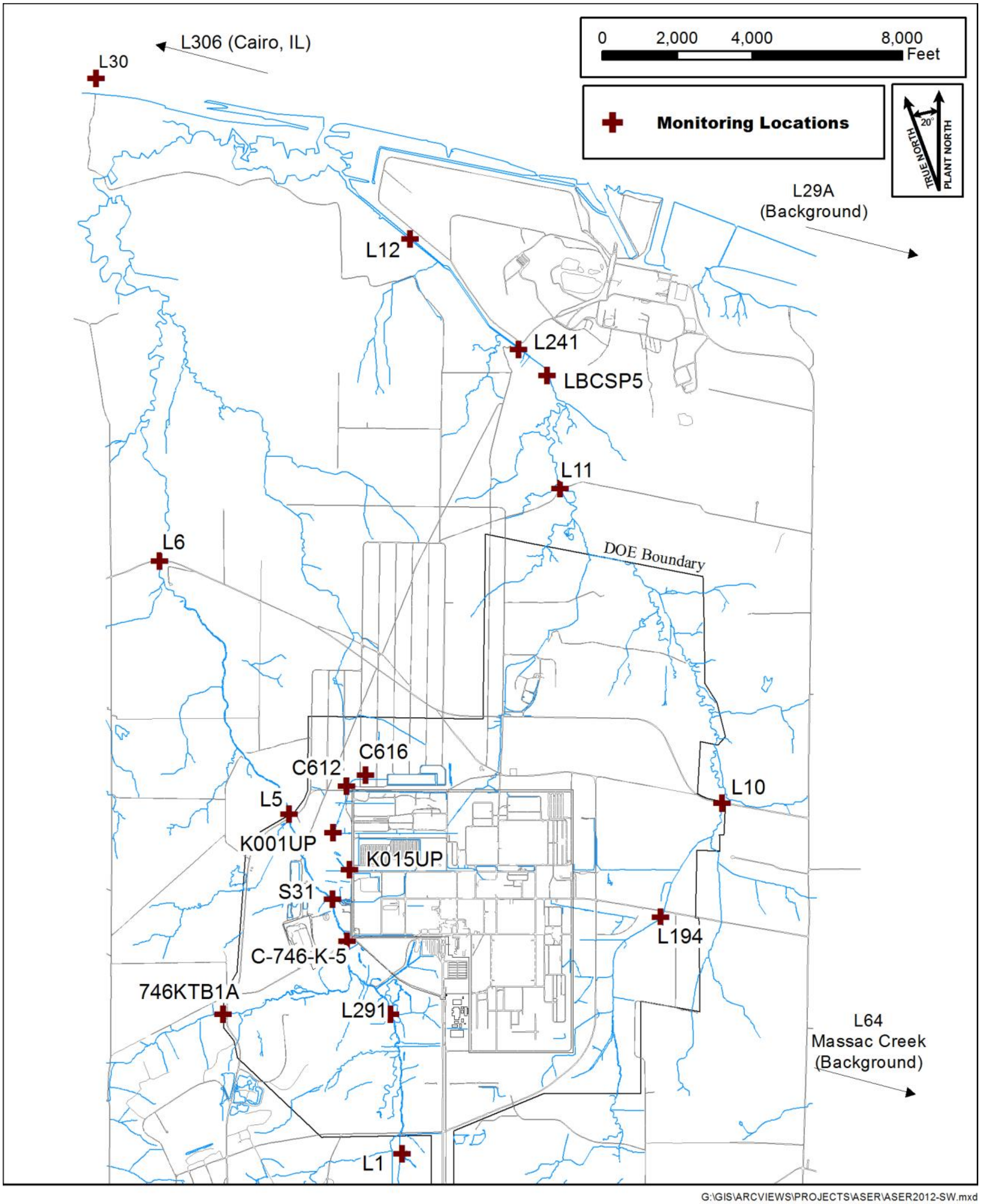

Figure 4.3. Historical Surface Water and Seep Monitoring Locations

Table 4.5. Average Radiological Results for Surface Water Surveillance Samples for CY 2008–2010[a]

Parameter (pCi/L, except where noted)	DCG[b]	Up-stream Bayou[1]	Bayou Near Site[2]	Down-stream Bayou[3]	Little Bayou near Site[4]	Down-stream Little Bayou[5]	C-746-K Landfill[6]	Up-stream Ohio[7]	Down-stream Ohio[8]	Massac Creek[9]	Cairo, IL[10]
Americium-241	30	0.0543[c]	0.0614[c]	0.0616[c]	0.0359[c]	0.0411[c]	0.0537[c]	0.0207[c]	0.0495[c]	0.0356[c]	0.0195[c]
Cesium-134	2,000	0.766[c]	1.14[c]	0.667[c]	1.88	1.16[c]	0.623[c]	0.698[c]	0.675[c]	0.896[c]	1.04[c]
Cesium-137	3,000	2.19[c]	1.63[c]	1.34[c]	1.76[c]	1.27[c]	1.12[c]	0.0954[c]	1.03	2.43[c]	1.54[c]
Cobalt-60	10,000	2.52[c]	1.81[c]	2.60[c]	2.29[c]	2.25[c]	1.37[c]	2.95	3.52[c]	2.86[c]	4.26[c]
Dissolved Alpha	--	3.66[c]	30.8	11.2[c]	5.47	4.66	3.29[c]	4.02[c]	6.08	4.52[c]	3.92[c]
Suspended Alpha	--	1.80[c]	3.15	2.39[c]	1.36[c]	3.33	2.28[c]	8.45	7.64[c]	1.78[c]	2.23[c]
Dissolved Beta	--	8.31[c]	70.9	33.9	10.8	20.9	10.0	5.15[c]	13.2	6.63[c]	10.1
Suspended Beta	--	3.61[c]	16.0	7.72[c]	6.06[c]	4.63[c]	4.48[c]	20.8	10.3	5.54[c]	12.8
Neptunium-237	30	0.0763[c]	0.121	0.217[c]	0.0379[c]	0.0593[c]	0.0363[c]	0.00562[c]	0.0212[c]	0.0287[c]	0.0329[c]
Plutonium-238	40	0.0225[c]	0.0310[c]	0.0222[c]	0.0182[c]	0.0229[c]	0.030[c]	0.0140[c]	0.0132[c]	0.0125[c]	0.0280[c]
Plutonium-239/240	30	0.0187[c]	0.0354	0.0148[c]	0.0218[c]	0.0206[c]	0.0199[c]	0.0144[c]	0.0209[c]	0.0221[c]	0.0165[c]
Potassium-40	7,000	42.9	45.5	49.1	25.7	32.0	28.6	62.8	47.5	57.4	34.8[c]
Technetium-99	100,000	17.2	28.8	10.8[c]	10.9[c]	27.0	11.7[c]	9.17[c]	26.0	10.6[c]	10.6[c]
Thorium-228	400	0.481[c]	0.410	0.514[c]	0.526	0.397[c]	0.411[c]	0.409[c]	0.283	0.424	0.590
Thorium-230	300	0.113[c]	0.191	0.114[c]	0.130[c]	0.240[c]	0.145[c]	0.0810[c]	0.0518[c]	0.132[c]	0.0915[c]
Thorium-232	50	0.0268[c]	0.0531[c]	0.0333[c]	0.0542[c]	0.0490[c]	0.0258[c]	0.0754[c]	0.0270[c]	0.0375[c]	0.0155[c]
Thorium-234	10,000	13.0[c]	53.0	47.6[c]	29.4[c]	7.78[c]	34.6[c]	1.45[c]	39.6[c]	2.12[c]	24.6[c]
Uranium (mg/L)	--	0.00500[d]	0.0151	0.0398	0.0165	0.00767	0.00500[d]	0.00500[d]	0.00500[d]	0.00900	0.00500[d]
Uranium	600	0.249[c]	32.2	9.59	5.88	3.02	0.314[c]	1.12[c]	0.856[c]	1.20[c]	0.884[c]
Uranium-234	500	0.144[c]	8.39	3.60	1.05	0.661	0.199[c]	0.868[c]	0.742[c]	0.899	0.829[c]
Uranium-235	600	0.0232[c]	0.602	0.184	0.139	0.0994	0.0260[c]	0.00546[c]	0.0244[c]	0.0395[c]	0.0152[c]
Uranium-235 (wt.%)	--	N/A	0.564	0.500	0.257	0.231	N/A	N/A	N/A	N/A	N/A
Uranium-238	600	0.110[c]	23.4	5.80	4.70	2.39	0.137	0.292	0.327	0.556	0.372

[a] The results presented in the table are the averages of the highest reported result within the area groupings over a three-year time span.
[b] Derived Concentration Guide (see Liquid Effluents chapter for definition) (see Appendix B for additional information).
[c] Results for this location all are reported at activities less than the laboratory's minimum detectable activity and/or radiological uncertainty.
[d] Results for this location all are reported at concentrations less than the laboratory's reporting limit.
-- DCGs for these radionuclides not provided.
N/A = result not available.
The following footnotes correspond with column titles in this table. These are groupings of sampling locations in the area described in the title.
1 = L1 (Background)
2 = C612, C616, K001UP, K015UP, L291, S31
3 = L5, L6
4 = L10, L194,
5 = L11, L12, L241
6 = 746KTB1A, C-746-K-5
7 = L29A (Background)
8 = L30
9 = L64
10 = L306

the factors used to determine the impact of plant effluents on Little Bayou Creek and Bayou Creek. The radionuclide levels found, which could be referenced to plant operations, were well below their respective DCGs. Additionally, although the table is a compilation of averaged data results, only detected concentrations were used in the averaging process; therefore, there may be instances where the reported average result is the maximum reported result if all other results throughout the year were undetected for a given radionuclide.

Table 4.6 provides the historical average concentrations of radiological parameters at one seep location, LBCSP5. Historical results indicate that the concentration of Tc-99 is higher at this seep than at other surface water locations on Little Bayou Creek; however, these concentrations are well below the Northwest Plume IRA target treatment level of 900 pCi/L and the EPA MCL of 900 pCi/L. Additional radiological surface water data are presented in Tables C.1.1 through C.1.10 in Appendix C of this report.

DCG levels established by DOE Order 5400.5 are screening values for the protection of human health and the environment. Beginning in 2013, DCS levels established by DOE Order 458.1 will be used for screening (see Appendix B).

Table 4.6. Average Radiological Sample Results for Surface Water Seep Location in Little Bayou Creek for CY 2008–2010

Parameter	LBCSP5 (pCi/L)	DCG (pCi/L)
Alpha Activity	1.07	--
Beta Activity	100	--
Plutonium-238	0.000[a,b]	40
Plutonium-239/240	0.000[a,b]	30
Technetium-99	101	100,000
Uranium	0.224[a]	600
Uranium-234	0.0826[a]	500
Uranium-235	0.0253[a]	600
Uranium-238	0.0514[a]	600

[a] Results for this location all are reported at activities less than the laboratory's minimum detectable activity and/or radiological uncertainty.
[b] Consistent with NRC guidance, 0.000 is presented for results reported less than zero.

Sediment

Sediment is an important constituent of the aquatic environment. If a pollutant is a suspended solid or attached to suspended sediment, it can settle to the bottom, be taken up by certain organisms, or become attached to plant surfaces. Pollutants transported by water can absorb on suspended organic and inorganic solids or be assimilated by plants and animals. Suspended solids, dead biota, and excreta settle to the bottom and become part of the organic substrata that support the bottom-dwelling community of organisms. Sediments can play a significant role in aquatic ecological impacts by serving as a repository for radioactive or chemical substances that pass via bottom-feeding biota to the higher trophic levels thus creating the need for sediment data.

Sediment Surveillance Program

DOE sampled sediments through a radiological environmental surveillance program. Historically, dose received from sediment has been calculated to be less than 1 mrem per year. The revised EMP changed the sampling requirements so that, beginning October 1, 2010, sediments were sampled only for nonradiological parameters due to the lack of a viable mechanism to increase the radioactivity found in sediments (LATA Kentucky 2011; LATA Kentucky 2012a). Similar to the process used for surface water runoff, sediment data were reviewed from 2008–2010. Site operations in 2012 were consistent with 2008–2010 operations, and there were no accidental releases that could have affected the sediment. The average results from these samples were used for the dose calculations presented in subsequent sections. Historically, sediment samples were taken from 14 locations (Figure 4.4). Table 4.7 shows the radiological analytical parameters used from 2008–2010.

Sediment Surveillance Results

Table 4.8 shows the average concentrations of radionuclides in the sediments upstream and downstream of DOE from 2008–2010. The sample locations are similar to those of the surface water surveillance program, except for the addition of NSDD, and the deletion of the Ohio and Mississippi Rivers from sediment surveillance (Figure 4.4).

Table 4.8 reflects only those radionuclide parameters in which at least one sampling location was reported at a concentration greater than the laboratory detection limit. As such, not all parameters listed in Table 4.7 are cited in Table 4.8.

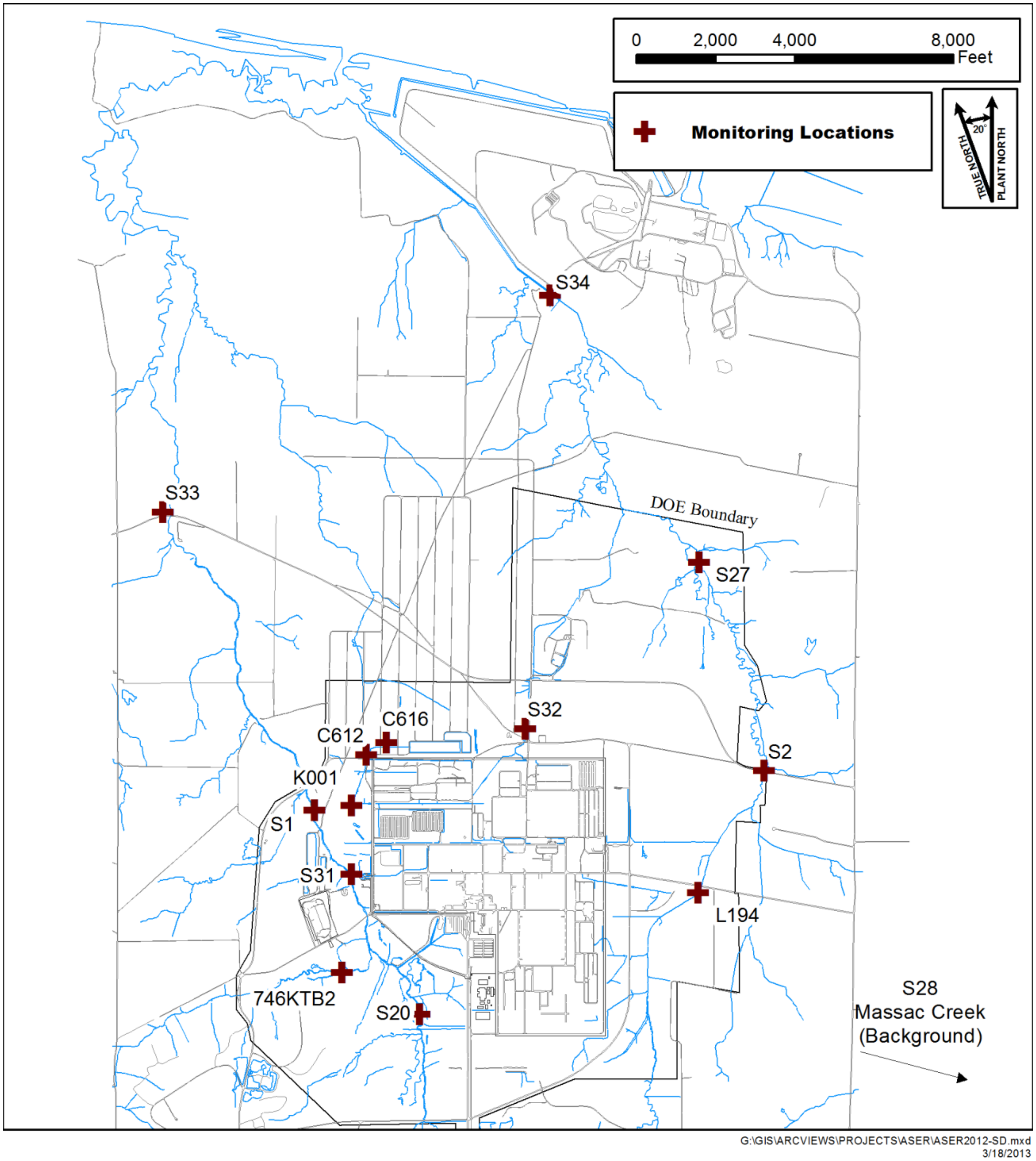

Figure 4.4. Sediment Monitoring Locations

Table 4.7. Radiological Parameters for Sediment Samples

Parameter	
Activity of Uranium-235	Technetium-99
Americium-241	Thorium-228
Cesium-134	Thorium-230
Cesium-137	Thorium-234
Cobalt-60	Uranium*
Neptunium-237	Uranium-234
Plutonium-238	Uranium-235
Plutonium-239/240	Uranium-238

*Uranium was analyzed both as a metal (reported in mg/kg) and as a radionuclide, calculated from the sum of the uranium isotopes (reported in pCi/kg).

Table 4.8. Average[a] Radiological Results for Sediment Surveillance Samples for CY 2008–2010

Parameter (pCi/g, except where noted)	Upstream Bayou[1]	Bayou Near Site[2]	Down-stream Bayou[3]	Little Bayou Near Site[4]	Down-stream Little Bayou[5]	C-746-K Area[6]	NSDD[7]	Massac Creek[8]
Alpha Activity	4.58	18.2	6.71	10.98	10.31	5.46	43.2	4.47
Americium-241	0.00570[b]	0.0203	0.00816[b]	0.00467[b]	0.0278	0.00739[b]	0.420	0.00265[b]
Beta Activity	4.03	31.9	8.74	17.9	9.93	5.44	49.4	2.10
Cesium-137	0.0282[b]	0.0964	0.0766	0.0289	0.0639	0.0216[b]	0.373	0.0049[b]
Cobalt-60	0.0193[b]	0.00912[b]	0.0253[b]	0.0130[b]	0.0102[b]	0.0107[b]	0.000[bd]	0.00460[b]
Neptunium-237	0.00357[b]	0.167	0.0115[b]	0.0112	0.0117	0.0150[b]	0.448	0.00175[b]
Plutonium-239/240	0.00338[b]	0.0899	0.0125	0.00277[b]	0.0959	0.0322	1.41	0.00143[b]
Potassium-40	8.54	7.67	7.82	4.88	4.70	4.13	6.67	7.46
Technetium-99	3.41	9.49	7.74	0.571	1.90	0.460	18.8	0.654
Thorium-230	0.341	1.04	0.585	0.294	1.87	0.253	21.1	0.257
Uranium (mg/kg)	99.8[c]	96.6[c]	97.8[c]	96.2[c]	96.1[c]	98.8[c]	95.8[c]	96.9[c]
Uranium	0.333[b]	10.6	1.61	13.0	3.47	2.09	5.11	0.310
Uranium-234	0.168	5.29	0.734	1.40	0.709	0.852	2.24	0.149
Uranium-235	0.00583[b]	0.250	0.0394	0.164	0.0627	0.0457	0.118	0.0143
Uranium-235 (wt.%)	N/A	1.06	0.803	0.346	0.395	0.591	0.662	1.49
Uranium-238	0.163	5.33	0.832	11.4	2.70	1.20	2.76	0.147

[a] The results presented in the table are the averages of the highest reported result within the area groupings over a three-year time span.
[b] Results for this location all are reported at activities less than the laboratory's minimum detectable activity and/or radiological uncertainty.
[c] Results for this location all are reported at concentrations less than the laboratory's reporting limit.
[d] Consistent with NRC guidance, 0.000 is presented for results reported less than zero.
N/A = result not available.
The following footnotes correspond with column titles in this table. These are groupings of sample locations in the area described in the title and are shown on Figure 4.4.

1 = S20 (Background)
2 = C612, C616, K001, S1, S31
3 = S33
4 = S2, L194
5 = S27, S34
6 = 746KTB2
7 = S32 [postremediation data only (i.e., 2010)]
8 = S28 (Background)

Location S32 has the highest levels of most radionuclides. This location is within the buffer area surrounding PGDP and access is limited. Uranium activity also is elevated in Little Bayou Creek and Bayou Creek near the plant site and downstream. The downstream location (S34) on Little Bayou Creek corresponds with the surface water seep site (LBCSP5) previously mentioned.

Other radionuclides, although present, are not significantly above background levels. Additional sediment data are presented in Tables C.4.21 through C.4.34 in Appendix C, of this report.

Areas that contain elevated radionuclide levels are controlled within the DOE property boundaries or are posted for protection. Complete annual dose estimates can be found in this chapter of the ASER. Authorized limits for this area are being developed and may be implemented in 2013.

Deer Harvest

DOE notified Kentucky Department of Fish and Wildlife Resources in July 2011 that it was ceasing deer harvesting from the Paducah Site (DOE 2011d). The lack of detection for some contaminants, such as PCBs in deer liver, was the basis for the elimination. PCB levels have been below levels the Food and Drug Administration considers safe to protect human health. In addition, a comparison of the metals detected in the deer with average chemical data from background deer collected shows no chemicals significantly above background. Remediation efforts performed by DOE and its contractors are working to control/eliminate contaminant sources at the site. Recreational activities were expanded in the DOE-owned land in the WKWMA in 2012. Expanded activities included youth turkey hunting, horseback riding, hiking, dog training and trials, gun hunting for small game, increased bow hunting for deer, mountain biking, and nature hiking. The expansion took effect January 1, 2012, after a new five-year license agreement was signed between the Kentucky Department of Fish and Wildlife Resources and DOE, but most activities were not implemented until the fall 2012 hunting season.

Direct Radiation

A potential concern from DOE's operations at the Paducah Site is direct external radiation exposure. External radiation exposure is defined as exposure attributed to radioactive sources outside the body (e.g., cosmic gamma radiation). Sources of external radiation exposure at the Paducah Site include the cylinder storage yards, the operations inside the cascade building, and small sources such as instrument check locations. Cylinder storage yards have the largest potential for a dose to the public because of their proximity to the PGDP security fence.

The Paducah Site EMP (LATA Kentucky 2011; LATA Kentucky 2012a) established DOE's program for monitoring external gamma radiation at areas accessible to members of the public. The External Radiation Exposure Monitoring Program has the following three objectives:

(1) To establish the radiation dose potentially received by a member of the public from direct exposure to DOE operations at the boundary of the PGDP perimeter fence;

(2) To establish the dose potentially received by a member of the public visiting or passing through accessible portions of the DOE Reservation; and

(3) To calculate the radiation dose equivalent for the maximally exposed individual member of the public.

In 2012, direct radiation was monitored by quarterly placement, collection, and analysis of environmental thermoluminescent dosimeters (TLDs). These monitoring locations are shown in Figure 4.5. Monitoring results indicate that 13 of 42 locations were consistently above background levels, as reported in the *Annual Report on External Gamma Radiation Monitoring for CY 2012, Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (LATA Kentucky 2013c). Most of these locations were at or near the PGDP security fence in the vicinity of UF_6 cylinder storage yards in areas that until recently were not accessible to members of the public. (After a new five-year license agreement was signed between the Kentucky Department of Fish and Wildlife Resources and DOE, the public now is allowed access to areas in proximity to cylinder yards that are subjected to dose rates above ambient background levels.) TLD-40, located off Dyke Road at the boundary of the DOE Reservation leased to WKWMA, indicated external radiation levels at or slightly above background (see page 4-18). This area has limited recreational access.

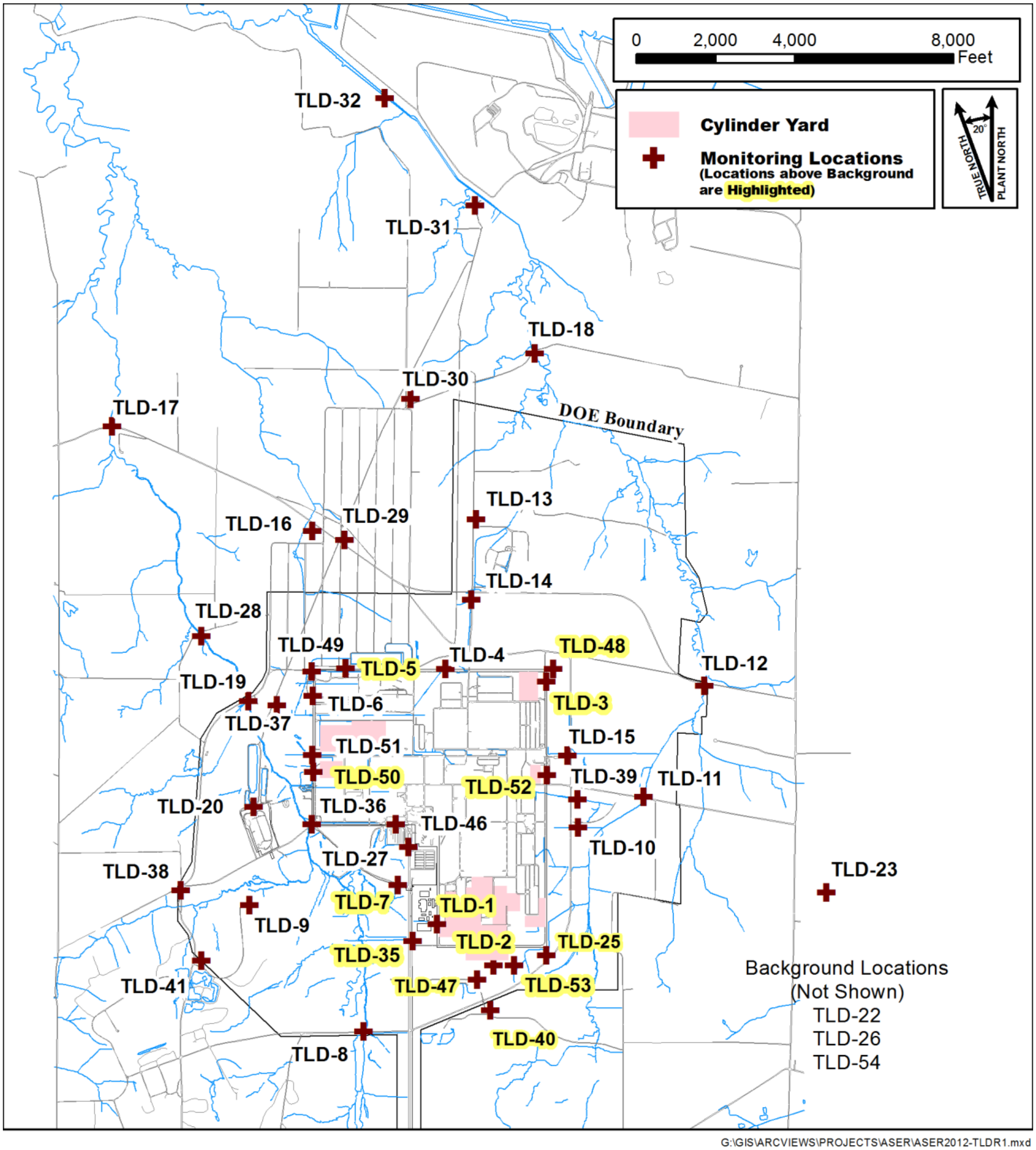

Figure 4.5. TLD Locations in the Vicinity of PGDP

Annual dose rates for the background locations and 13 locations above background were calculated. Based on the analysis of TLDs placed away from DOE property, the mean annual background exposure was determined to be 87 mrem (LATA Kentucky 2013c). For each location, the mean background exposure was subtracted from the annualized total exposure to obtain a net annual exposure. The net annual exposure represents the total exposure at that location for the entire CY 2012 attributed to the Paducah Site (Table 4.9). Exposure measured at these locations is assumed to result from DOE

Table 4.9. Net Annual Exposure from Direct Radiation Attributed to the Paducah Site for CY 2012 (mrem)

Location	Annualized Total Exposure (mrem)	Average Background Plus Three Standard Deviations (mrem)[a]	Average Background (mrem)	Net Annual Exposure (mrem)[b]
TLD-1	920	100	87	833
TLD-2	1313	100	87	1,226
TLD-3	196	100	87	109
TLD-5	108	100	87	21
TLD-7	114	100	87	27
TLD-25	110	100	87	23
TLD-35	103	100	87	16
TLD-40	107	100	87	20
TLD-47	334	100	87	247
TLD-48	149	100	87	62
TLD-50	175	100	87	88
TLD-52	121	100	87	34
TLD-53	450	100	87	363

[a] Background is calculated based on the analysis of TLDs placed away from DOE property (LATA Kentucky 2013c).
[b] Locations with net annual exposure from direct radiation above background levels are in areas not accessible to the public, with the exception of TLD-40, which is located in an area recently opened for limited recreational use.

operations. With the exception of TLD-40, the external radiation exposures measured by TLDs in areas accessible to the public were not statistically above background (LATA Kentucky 2013c). In 2012, TLD-40, located off Dyke Road at the boundary of the DOE Reservation leased to WKWMA, indicated external radiation exposures above background (net annualized exposure of 20 mrem). Based on a recreational scenario occupancy factor of 700 hours per year for TLD-40 location, a recreator would receive 1.6 mrem per year [i.e., 20 mrem (see Table 4.9) × 700 hours per year ÷ (365 days per year × 24 hours per day)], below the applicable DOE limit of 25 mrem from any single source within a year, in accordance with DOE Order 458.1 (LATA Kentucky 2013b). The occupancy factor used for this location is based on Table D.18, Reasonable Maximum Exposure Assumptions and Human Intake Factors for External Exposure to Ionizing Radiation from Sediment by a Recreational User, in the Risk Methods Document (DOE 2011e). Direct radiation exposures are reported as effective dose, which is equivalent to effective dose equivalent for the purposes of this report. Refer to Appendix A for additional information.

Additional data are presented in Appendix C of this report.

4.4 RADIOLOGICAL DOSE CALCULATIONS

This section presents the calculated radiological doses to individuals and the surrounding population from atmospheric and liquid releases from the Paducah Site, as well as from direct radiation (Chapters 4 and 5). Doses from naturally occurring sources are discussed in Appendix A. The highest estimated dose that a maximally exposed individual might have received from all combined DOE exposure pathways (worst-case scenario) was 1.902 mrem per year. This dose is significantly less than the applicable federal standard of 100 mrem per year.

DOE Order 458.1, *Radiation Protection of the Public and the Environment,* limits the dose to members of the public to less than 100 mrem per year total effective dose equivalent from all pathways resulting from operation of a DOE facility. Information on the demography and land use of the area surrounding the plant was used to develop exposure pathways of concern. On-site operations were used to determine which radionuclides to evaluate.

An early preliminary assessment of risk to public health from contaminants at the Paducah Site identified the following four primary exposure routes, each of which could contribute at least 1% to the total off-site dose: (1) groundwater ingestion, (2) sediment ingestion, (3) wildlife ingestion, and (4) exposure to direct radiation. Since that preliminary assessment, groundwater wells that supplied drinking water downgradient from PGDP have been replaced with public drinking water, resulting in the loss of that exposure route. A drinking water pathway for consumption of surface water at the nearest public drinking water source [Ohio River at Cairo, Illinois (L306)] is included in dose calculations. Surface water is not used for drinking water in the PGDP area. Initiation of the NWPGS and the NEPCS resulted in an airborne pathway that is included in the dose calculations. The demolition of the C-340, and DUF_6 conversion activities were included in 2012 airborne pathway dose calculations.

To assess fully the potential dose to the public, a hypothetical set of extreme characteristics was used to postulate an upper limit to any real dose. This is referred to as the worst-case scenario. The actual dose received is likely to be considerably less than the hypothetical dose calculated.

Terminology and Internal Dose Factors

Most of the human health consequences associated with radionuclides released to the environment are due to either external gamma exposure or intake of radioactive material into the body. These exposures/intakes involve the transfer of energy from radiation to tissue and can result in tissue damage. Radiation may come from radionuclides outside the body or from radionuclides deposited inside the body (by inhalation, ingestion, and, in a few cases, absorption through the skin). Exposures to radiation from radionuclides outside the body are called external exposures; exposures to radiation from radionuclides inside the body are called internal exposures. This distinction is important because external exposure occurs only as long as a person is near the radionuclide; simply leaving the area of the source will stop the exposure. Internal exposure continues as long as the radionuclide remains inside the body.

Damage associated with exposures to radiation results primarily from the deposition of radiant energy in tissue. The exposure is defined in terms of the amount of incident radiant energy absorbed by tissue and the biological consequences of that absorbed energy. These terms or quantities include the following:

- *Committed effective dose equivalent (CEDE)*—the sum of total absorbed dose (measured in mrem) to a tissue or organ received over a 50-year period resulting from the intake of radionuclides, multiplied by the appropriate weighting factor. The CEDE is the product of the annual intake (pCi) and the dose conversion factor for each radionuclide (mrem/pCi). DOE Order 458.1 replaces this term with *committed effective dose*.

- *Effective dose equivalent*—includes the CEDE from internal deposition of radionuclides and the dose from penetrating radiation from sources external to the body. This is a risk-equivalent value and can be used to estimate the potential health risk to the exposed individual. DOE Order 458.1 replaces this term with *effective dose*.

- *Total effective dose equivalent*—includes the sum of the effective dose equivalent (for external exposures) and the CEDE (for internal exposures). For purposes of compliance, dose equivalent to the whole body may be used as the effective dose equivalent for external exposures. DOE Order 458.1 replaces this term with *total effective dose*.

The effect of an intake of a radionuclide by ingestion depends on the concentration of the radionuclide in food and drinking water and on the individual's consumption patterns. The estimated intake of a radionuclide is multiplied by the appropriate ingestion dose factor to provide the CEDE estimate resulting from the intake. Internal dose factors for several radionuclides of interest at the Paducah Site are included in Appendix A.

Landfill Authorized Limits

DOE authorized limits initially were established for the C-746-U Landfill in May 2003 under DOE Order 5400.5, Change 2, *Radiation Protection of the Public and the Environment*, for the identification of residual radioactive material. The limits were based on not exceeding 1 mrem/year of dose to any member of the public for postclosure, likely use scenarios. Dose from groundwater contamination was limited to 4 mrem/year for all use scenarios. The initial modeling was based on conservative assumptions using a fixed ratio of radionuclides for a small portion of the landfill. The limits also were based on the waste projections for the years 2003 to 2010.

Since the initial authorized limits did not include cleanup activities of the entire PGDP site that require additional waste cells in the landfill, a reevaluation of the authorized limits was needed. The new revision now includes use of the entire landfill and is based on residual radioactive waste projected from the cleanup of the PGDP Site. The reevaluation was performed using the latest available information on waste projections, transportation modeling of radioactivity, and exposure modeling.

DOE contracted Oak Ridge Institute for Science and Education (ORISE) to conduct dose modeling. Instead of using a fixed ratio of radionuclide, ORISE modeled each isotope individually. ORISE analyzed the exposure of individuals based on probable and implausible scenarios, geological parameters, radionuclide concentration, and exposure pathways. ORISE provided DOE with dose to source ratios for each radionuclide. DOE then performed an ALARA analysis (including a cost benefit analysis) to determine the lowest, reasonable levels for each radionuclide. After the limits for each radionuclide were set, an analysis of future exposure to landfill workers and members of the public was performed. The new authorized limits would not expose any member of the public to a dose of 1 mrem per year for any likely scenario.

The authorized limit process followed DOE Order 458.1. The revised authorized limits were consistent with the dose target for the public as agreed to by DOE, EPA, and the Commonwealth of Kentucky in DOE/EA-1414, *Final Environmental Assessment of the Implementation of the Authorized Limits Process for the Waste Acceptance Criteria at the C-746-U Landfill, Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (August 2002). The new authorized limits were approved and implemented in November 2011 following *C-746-U Landfill Authorized Limits Approval and Implementation Requirements* (DOE 2011f) and supported by *Dose Modeling Evaluations and Technical Support Document for the Authorized Limits Request for the C-746-U Landfill at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (ORISE 2012).

The authorized limits apply to the disposal of soil, metal, and debris waste generated from the construction, maintenance, environmental restoration, and D&D activities at PGDP into the C-746-U Landfill. During 2012, approximately 2,015 tons of authorized limit waste were shipped to the C-746-U Landfill for disposal. Exposure measurements (based on dosimetric measurements) to the landfill workers during this period were found to be indistinguishable from background. Table 4.10 presents the authorized limit inventory (in curies) dispositioned in the C-746-U Landfill in 2012 and the cumulative inventory dispositioned into the landfill since 2003.

Table 4.10. Summary of Authorized Limits Waste Disposed of in C-746-U Landfill

Isotope	Activity Disposed of 1/1/12 to 12/31/12	Cumulative Disposed of 5/21/03 to 12/31/12		
	Activity (Ci)	Activity (Ci)	Source Term Limit (Ci)	% Inventory Used
Americium-241	0.00140	0.0078	79	0.01%
Cesium-137	0.00114	0.0115	43	0.03%
Neptunium-237	0.00076	0.0124	12	0.10%
Plutonium-238	0.00250	0.0046	88	0.01%
Plutonium-239/240	0.00104	0.0150	162	0.01%
Technetium-99	0.0299	1.0365	117	0.89%
Thorium-228	0.00399	0.3407	9	3.79%
Thorium-230	0.00546	0.5859	230	0.25%
Thorium-232	0.00455	0.0050	9	0.06%
Uranium-234	0.04128	0.0418	360	0.01%
Uranium-235	0.00208	0.0026	15	0.02%
Uranium-238	0.06276	0.0633	360	0.02%

Direct Radiation

In 2012, DOE conducted continuous monitoring for direct external radiation exposure. The public does not have access to the PGDP boundary fence; therefore, the radiation doses measured at the fence do not apply to members of the public. In 2012, TLD-14 and TLD-40 represented the closest locations that would be accessible to the public. TLD-14 is near Harmony Cemetery, located north of the plant security fence and south of Ogden Landing Road. Measurements at this location indicated external radiation exposures at the derived background radiation level. In 2012, TLD-40, located on the DOE Reservation boundary with the DOE-leased WKWMA area off Dyke Road, indicated external radiation exposures above background. Additional information is available in the *Annual Report on External Gamma Radiation Monitoring for Calendar Year 2012* (LATA Kentucky 2013c). This location has limited access to a recreational user and gamma radiation well below 100 mrem (see Section 4.3). The maximally exposed individual, at the nearest local residence, also was found to be at background levels. Based on the results of the gamma radiation exposure measurements made during CY 2012, the effective dose from external exposure to the maximally exposed individual member of the public from DOE operations was estimated at 1.6 mrem/year, below the applicable DOE limit of 25 mrem from any single source within a year, in accordance with DOE Order 458.1 (LATA Kentucky 2013b).

Surface Water

The most common surface water exposure pathway is through drinking water containing radionuclides. Surface water pathway dose was calculated for an individual assumed to consume water from the public drinking water supply at Cairo, Illinois (L306). Cairo is the closest drinking water system (approximately 30 miles downstream) that uses water downstream of PGDP effluents. Cairo is located at the confluence of the Ohio and Mississippi Rivers. The average concentrations of radionuclides that were detected near the surface water collection inlet at Cairo from 2008–2010 were used to calculate the exposure resulting from consumption of surface water. Site operations in 2012 were consistent with 2008–2010 operations, and there were no accidental releases that could have affected the surface water.

As shown in Table 4.5, U-238 was detected in Cairo at an average concentration of 0.372 pCi/L. These results are well below their respective DCG levels of 600 pCi/L. Although U-238 is an alpha emitter, no detectable concentrations of total alpha activity were reported at Cairo. Sources for U-238 other than the Paducah Site may attribute to the concentrations reported at Cairo.

For the dose calculation from U-238, the maximally exposed individual was assumed to consume all of his/her daily required water, 8 glasses, each containing 8 ounces (a total of approximately 2 liters), 365 days a year from the public drinking water supply. The maximum dose to an individual was determined to be 0.136 mrem in 2012, which is significantly less than the 25 mrem for any single source allowed by DOE Order 458.1.

Contaminated Sediment

Exposure to contaminated sediment in Bayou Creek and Little Bayou Creek could occur during fishing, hunting, or other recreational activities. Exposure is possible through incidental ingestion of contaminated sediment. The worst-case ingestion assumption is that an adult individual would splash around in one of the creeks every other day during the season (104 days/year) and ingest a small amount of sediment each visit (100 mg/day). A dose then is calculated based on the radionuclide concentrations and the amount of exposure via ingestion. Massac Creek samples are assumed to be background and are subtracted from downstream sample results to arrive at a dose associated with site releases. The downstream location with the maximum dose is assumed to represent the dose received from this pathway by the maximally exposed individual.

Doses are calculated for ingestion of sediments for both Bayou Creek and Little Bayou Creek using the average radiological results for sediment surveillance samples for CY 2008–2010 (Table 4.8). The worst-case dose was calculated to be at S32, the NSDD, although this is an unlikely scenario since the area has 10 *CFR* 835 controls (Figure 4.5). The estimated worst-case dose above background from sediment ingestion was 0.161 mrem. This exposure pathway is by far the major contributor to the worst-case combined exposure to the public, and it is significantly less than the DOE annual dose limit of 25 mrem/year for any single source. Dose results for all locations are provided in Table 4.11.

Airborne Radionuclides

DOE had four radionuclide airborne sources that contributed to the public dose in 2012. These sources were the NWPGS, the NEPCS, C-340 demolition, and DUF_6 conversion operations. The four sources were discussed in Section 4.2. These sources were reviewed or monitored to determine the extent to which the general public could be exposed and to demonstrate compliance with EPA regulations.

The 50-year CEDE (internal) from DOE air sources to the maximally exposed individual, who under most circumstances is the person living closest to the plant in the predominant wind direction, is calculated each year. EPA-supplied CAP-88 Mainframe, Version 1.0, software was used to calculate the off-site dose from PGDP air emissions. This software provides a framework for developing dose and risk assessments for the purpose of demonstrating compliance with 40 *CFR* § 61.93(a). It assesses both collective populations and maximally exposed individuals. The effective dose equivalent to the maximally exposed individual for the plant from DOE radioactive air emissions was calculated to be 0.000022 mrem. The maximally exposed individual from all plant emissions is located 6,693 ft north of the C-310 stack (a USEC source). The effective dose equivalent from both DOE and USEC emissions is estimated to be 0.0047 mrem, which is well below the 10 mrem limit of 40 *CFR* § 61, Subpart H.

Table 4.11. Annual Dose Estimates for CY 2012 Incidental Ingestion of Sediment from Bayou Creek and Little Bayou Creek[a]

Location	Committed Effective Dose Equivalent (mrem)											
	Am-241	Cs-137	Co-60	Np-237	Pu-239/ Pu-240	K-40	Tc-99	Th-230	U-234	U-235	U-238	Total (mrem)
Upstream Bayou[1]	3.05E-05	3.77E-03	1.13E-02	1.12E-04	1.50E-05	--	2.53E-05	1.06E-04	1.21E-05	--	1.68E-04	1.56E-02
Bayou Near Site[2]	1.77E-04	1.48E-02	3.48E-03	1.02E-02	6.81E-04	--	8.11E-05	9.85E-04	3.27E-03	8.60E-03	5.46E-02	9.69E-02
Downstream Bayou[3]	5.51E-05	1.16E-02	1.59E-02	6.02E-04	8.52E-05	--	6.50E-05	4.13E-04	3.73E-04	9.16E-04	7.21E-03	3.73E-02
Little Bayou near Site[4]	2.02E-05	3.89E-03	6.46E-03	5.83E-04	1.03E-05	--	--	4.65E-05	7.97E-04	5.46E-03	1.18E-01	1.36E-01
Downstream Little Bayou[5]	2.52E-04	9.56E-03	4.31E-03	6.14E-04	7.27E-04	--	1.14E-05	2.03E-03	3.57E-04	1.77E-03	2.69E-02	4.65E-02
C-746-K Landfill[6]	4.74E-05	2.71E-03	4.69E-03	8.18E-04	2.37E-04	--	--	--	4.48E-04	1.15E-03	1.11E-02	2.12E-02
NSDD[7]	4.17E-03	5.97E-02	--	2.75E-02	1.08E-02	--	1.66E-04	2.62E-02	1.33E-03	3.78E-03	2.75E-02	1.61E-01
	Net Exposure from Paducah Site to maximally exposed individual[b,c] (NSDD) =											**0.161**

-- Not detected or not a PGDP-related contaminant.
[a] Doses are calculated for ingestion of sediments for both Bayou Creek and Little Bayou Creek using the average radiological results for sediment surveillance samples for CY 2008–2010 (Table 4.8).
[b] Maximum allowable exposure is 100 mrem/year for all contributing pathways and 25 mrem/year from one source (DOE Order 458.1).
[c] Radionuclide concentrations from Massac Creek are considered background and have been subtracted from PGDP related concentrations prior to calculation of dose.
The following footnotes correspond with column titles in this table. These are groupings of sample locations in the area described in the title and are shown on Figure 4.4.
1 = S20 (Background)
2 = C612, C616, K001, S1, S31
3 = S33
4 = S2, L194
5 = S27, S34
6 = 746KTB2
7 = S32

Conclusions

Table 4.12 provides a summary of the radiological dose for 2012 from the Paducah Site that could be received by a member of the public assuming worst-case exposure from all major pathways. The largest contributor to the calculated dose is from direct radiation. The groundwater pathway from DOE sources is assumed to contribute no dose to the population, because DOE has supplied all residents with public water. The worst-case combined (internal and external) dose to an individual member of the public was calculated at 1.902 mrem. This level is well below the DOE annual dose limit of 100 mrem/year to members of the public and below the EPA limit of 10 mrem airborne dose to the public.

Estimates of radiation doses presented in this report were calculated using the dose factors provided by DOE and EPA guidance documents and found within the Risk Methods Document (DOE 2011e). These dose factors are based on International Commission on Radiological Protection Publication 30 (ICRP 1980). Figure 4.6 shows the potential (worst-case) annual dose as calculated for the past five years.

The increase in potential radiological dose in 2012 is due to the revised license agreement that now allows the public access to areas in proximity to cylinder yards that are subjected to dose rates above ambient background levels.

4.5 UNPLANNED RADIOLOGICAL RELEASES

There were no unplanned radiological releases at PGDP in 2012.

Table 4.12. Summary of Potential Radiological Dose from the Paducah Site for CY 2012[a] (Worst-Case Combined Exposure Pathways)

Pathway	Dose to Maximally Exposed Individual[b] (mrem/year) (mSv/yr)	Percent of Total	Percent of DOE 100 mrem/yr Limit
Incidental ingestion of surface water	0.136 (1.36E-03)	7	0
Incidental ingestion of sediments	0.161 (1.61E-03)	8	0
Direct radiation	1.60 (1.60E-02)	84	2
Atmospheric releases[c]	0.0047 (4.70E-05)	0	0
Total annual dose above background (all pathways)[a]	**1.902 (1.90E-03)**	**100**	**2**

[a] Excluding ingestion of deer meat.
[b] Maximum allowable exposure from all sources is 100 mrem/year (DOE Order 458.1).
[c] DOE source emissions were from NWPGS, NEPCS, DUF_6 conversion activities and includes USEC emissions.

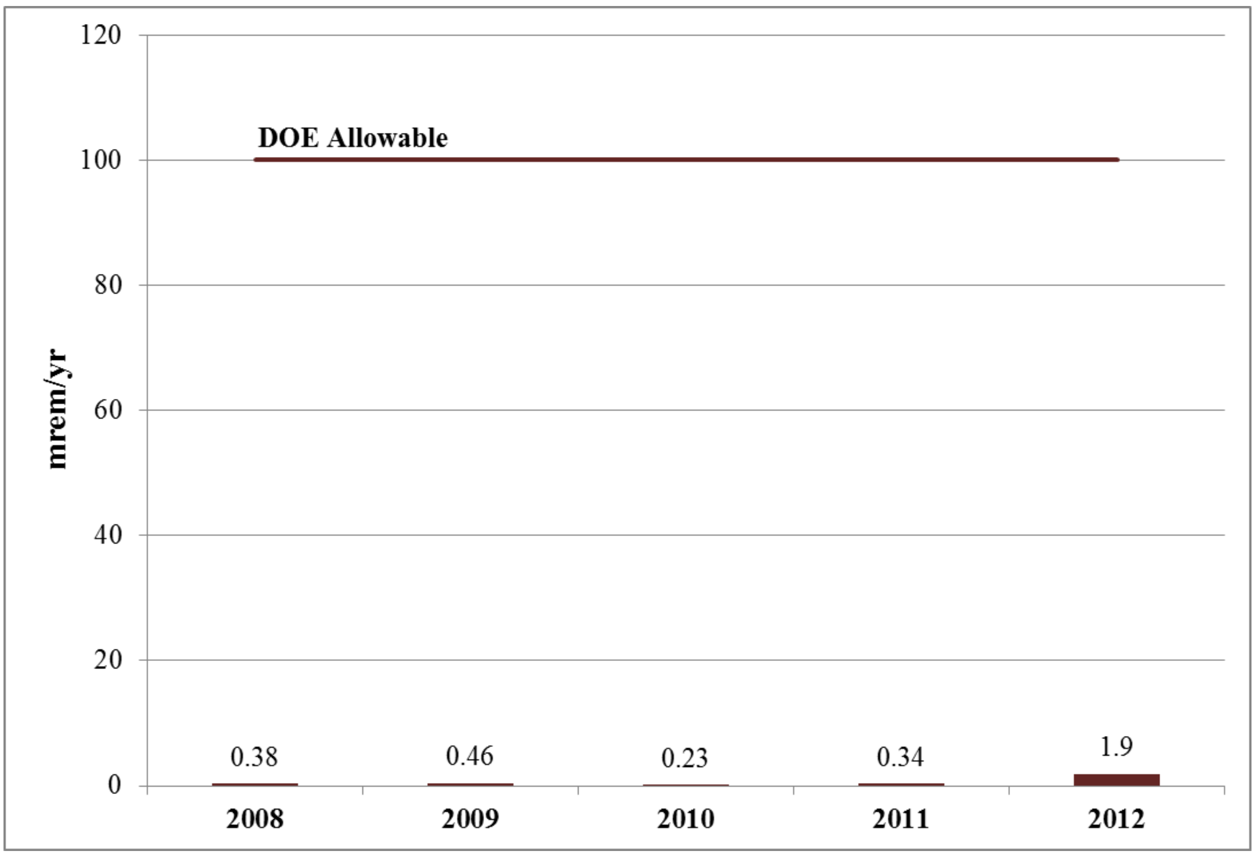

Figure 4.6. Potential Radiological Dose from Activities at the Paducah Site, 2007–2012

5. ENVIRONMENTAL NONRADIOLOGICAL PROGRAM INFORMATION

Liquid effluent monitoring was conducted at the DOE permitted outfalls and at landfill surface water runoff locations. Compliance with KPDES permit effluent limits was maintained in 2012. DOE continues to operate the Paducah Site as a minor air emission source primarily for HF and TCE.

5.1 NONRADIOLOGICAL POINT SOURCE EFFLUENT MONITORING

Introduction

USEC steam plant emissions are the largest monitored nonradiological point source at the site. Responsibility for this and other USEC emission points was turned over to USEC as a result of the 1993 lease agreement. The only DOE point source required to perform monitoring is the DUF_6 Conversion Facility. During 2012, initial HF stack sampling was performed in accordance with the requirements of Air Permit No. F-10-035R1.

Monitoring of nonradiological parameters in liquid effluents is summarized in the Paducah Site EMP (LATA Kentucky 2011; LATA Kentucky 2012a) and is based on KPDES permit KY0004049 and KDWM landfill permits SW07300014, SW07300015, and SW07300045. Effluents are monitored for nonradiological parameters listed on the permit.

Nonradiological Airborne Effluents

Airborne Effluent Applicable Regulations

The KDAQ administers much of the CAA at the Paducah Site. DOE has responsibility only for air emission sources under DOE program control; therefore, this report does not address emissions from the PGDP sources leased to USEC.

Airborne Effluent Monitoring Program

During 2012, stack testing protocol was utilized to perform continuous monitoring on the Conversion Building Stack, emission point U001, in accordance with the requirements of Air Permit No. F-10-035R1. Results of the stack test indicated nondetect for HF emissions while operating one conversion line. KDEP approved cessation of continuous monitoring of HF based on review of the stack test results and air dispersion modeling. Based on the KDEP emission inventory, the total 2012 estimated HF emission for emission points U001 and U002 is approximately 34 lb.

Additional remediation sources of air emissions other than radionuclides (Chapter 4) for the Paducah Site in 2012 were the NWPGS and the NEPCS. The NWPGS removed approximately 111,000,000 gal of groundwater containing approximately 1,930 lb of TCE. This facility removes TCE contamination from the groundwater by air stripping. TCE-laden air passes through activated carbon to remove TCE. The NEPCS removed approximately 87,800,000 gal of groundwater containing approximately 105 lb of TCE.

The NEPCS uses the existing C-637-2A Cooling Tower at PGDP for stripping TCE from groundwater. The air stream then is released to the atmosphere where any remaining TCE naturally breaks down. The NWPGS and NEPCS, operating in compliance with CERCLA decision documents, removed a total of 169 gal of TCE from the subsurface during 2012.

Nonradiological Liquid Effluents

Liquid Effluent Applicable Regulations

At the Paducah Site, the CWA regulations were applied through issuance of a KPDES permit for effluent discharges to Bayou Creek and Little Bayou Creek. The KDOW issued KPDES permit No. KY0004049 to the Paducah Site. This permit applies to the following five DOE outfalls: 001, 015, 017, 019, and 020.

The KPDES permit calls for chemical monitoring and toxicity monitoring as an indicator of discharge-related effects in the receiving streams. Biological monitoring (i.e., fish or benthic macroinvertebrate sampling) was not required under the specifications listed in the renewed KPDES permit. Additionally, the watershed monitoring plan was revised to reflect the changes in the renewed permit due to extensive samplings campaigns conducted in the past.

The KDWM specifies in landfill permits SW07300014, SW07300015, and SW07300045 that surface runoff will be analyzed to ensure that landfill constituents are not discharging into nearby receiving streams.

Liquid Effluent Monitoring Program

DOE conducts nonradiological effluent monitoring for outfalls under its jurisdiction (Chapter 4, Figure 4.3). Outfalls 001, 015, 017, 019, and 020 were monitored for KPDES permit parameters. The specific sample collection, preservation, and analytical methods acceptable for the types of constituents analyzed are listed in the permit and applicable regulations. The KPDES permit is available at the EIC, Barkley Centre, 115 Memorial Drive, in Paducah, Kentucky, for review by the public. Permit analytes are listed in Table 5.1. In this table, some results are not available for all parameters. This is signified by a descriptor of NR meaning that the result was “not reported” because that parameter was not required at that particular location; therefore, a sample was not collected. Results for additional parameters, not required by the permit, are shown Tables C.3.1 through C.3.5, of Appendix C of this report.

Surface runoff from the closed C-746-S Residential Landfill, the closed C-746-T Inert Landfill, and the operating C-746-U Landfill was monitored quarterly. Grab samples were monitored for chemical oxygen demand, chloride, conductivity, dissolved oxygen, total dissolved solids, flow rate, total iron, pH, sodium, sulfate, TSS, temperature, total organic carbon, and total solids. Two sets of samples are collected: one set for the C-746-U Landfill and one set for the C-746-S&T Landfills. The downgradient sampling location for the C-746-S&T Landfills is upgradient to the C-746-U Landfill and is used for both sampling matrices. The samples taken include landfill runoff, the receiving ditch upstream of the runoff discharge point, and the receiving ditch downstream of the runoff discharge point (Chapter 4, Figure 4.3). Sampling was performed in compliance with the KDWM requirements for operation of the contained landfill.

Table 5.1. KPDES Effective Permit Sampling Routine Nonradiological Maximum Detected Results for CY 2012

Parameter	Permit Discharge Limits During 2012	K001	K015	K017	K019	K020
1,1,1-Trichloroethane, µg/L	200	NR	NR	NR	NR	ND
Arsenic, mg/L	0.150	NR	NR	NR	NR	ND
Benz(a)anthracene, µg/L	Report	NR	ND	ND	NR	NR
Benzo(k)fluoranthene, µg/L	Report	NR	ND	NR	NR	NR
Carbonaceous Biochemical Oxygen Demand (mg/L)	Report	NR	NR	NR	NR	ND
Chlorides (mg/L)	600 (average) 1,200 (maximum)	NR	NR	NR	NR	42
Cyanide, mg/L	Report	ND	NR	NR	NR	NR
Dissolved Oxygen, mg/L	Report	NR	NR	NR	NR	9.87
Flow Rate, MGD	Report	9.21	1.325	4.6	0.15	0.08
Hardness—Total as $CaCO_3$, mg/L	Report	380	130	220	99	490
Heptachlor, µg/L	Report	ND	ND	ND	NR	NR
Indeno(1,2,3-cd)pyrene, µg/L	Report	0.1	NR	NR	NR	NR
Iron, mg/L	Report	NR	0.829	NR	0.158	1.23
Nickel, mg/L	0.094	NR	NR	NR	NR	0.0134
Nitrate as Nitrogen, mg/L	500	NR	NR	NR	NR	2.7
Oil and Grease, mg/L	10 (average) 15 (maximum)	ND	ND	ND	ND	ND
Polychlorinated biphenyls, µg/L	Report	ND	ND	ND	ND	ND
pH, Std Unit	Report	8.75	8.31	8.96	7.31	7.97
Phosphorous, mg/L	1	0.63	NR	NR	NR	0.11
Suspended Solids, mg/L	30 (average) 60 (maximum)[a]	73	159	22	ND	ND
Temperature, °F	89[b]	80.5	NR	81.8	NR	NR
Trichloroethene, µg/L	30.8[c]	ND	NR	NR	NR	ND
Total Residual Chlorine (mg/L)	0.01 (average) 0.019 (maximum)	ND	NR	NR	NR	NR
Uranium, mg/L	Report	0.0852	0.118	0.00389	ND	0.0299
Zinc, mg/L	0.216	NR	NR	0.321	ND	0.0372

[a] Suspended solids limits are applicable only to K001, K019, and K020. K015 and K017 are report only.
[b] Temperature limit is applicable only to K001 and K017.
[c] TCE limit is applicable only to K020. K001 is report only.

Liquid Effluent Monitoring Results

Analytical results from the five DOE outfalls are reported to KDOW in monthly and quarterly discharge monitoring reports. As stated above, the monitoring results for the outfalls are listed in Table 5.1.

Data for the KPDES samples and the surface runoff samples from the landfills are presented in Tables C.3.1 through C.3.10 of Appendix C of this report.

5.2 NONRADIOLOGICAL ENVIRONMENTAL SURVEILLANCE

Introduction

Nonradiological surveillance at the Paducah Site involves the sampling and analysis of surface water, groundwater, and sediment. This chapter discusses the nonradiological results of surveillance activities. Surveillance results were compared to the data obtained from the background locations, as well as historical results for trending purposes.

Ambient Air

As a result of the transfer of the operations of the plant to USEC in 1993, major air emission sources were transferred to USEC; therefore, DOE does not conduct ambient air monitoring for nonradiological parameters at the Paducah Site.

Surface Water

Surface water monitoring (except for toxicity monitoring) downstream of KPDES outfalls is not required by the KPDES permit; however, it is performed at the Paducah Site as part of the Environmental Surveillance Program. Figure 4.4 shows surveillance surface water sampling locations. Table 5.1 shows the analytical parameters that are analyzed on a quarterly or semiannual basis.

Seep locations in Little Bayou Creek were added to the surface water sampling program in 2002. Seep locations are defined as upwellings of groundwater in the Little Bayou Creek bed. Although there have been several locations sampled in the past, one location was chosen to sample each quarter to trend and observe changes in data. These quarterly sampling events are dependent on conditions at the seep location. During times of high water, obtaining a representative sample is not possible. In 2012, sampling was conducted in three quarters. Flooding conditions prevent sample collection during one quarter. The sampled seep (LBCSP5) is downstream of the plant site approximately halfway between the site and the Ohio River (see Figure 4.4). Table 5.2 does not apply to the quarterly seep locations. A different list of analytical parameters is analyzed for the seep location, as presented in Table 5.3.

Table 5.2. Nonradiological Parameters for Surface Water Surveillance Samples

Parameter	
PCB, Total	Alkalinity
PCB-1016	Conductivity
PCB-1221	Dissolved Oxygen
PCB-1232	Flow Rate
PCB-1242	pH
PCB-1248	Temperature
PCB-1254	TCE
PCB-1260	
PCB-1268	

Table 5.3. Nonradiological Parameters for Surface Water Seep Sample

Parameter
Alkalinity
Conductivity
Dissolved Oxygen
Flow Rate
pH
Temperature
TCE

Surface Water Surveillance Results

Table 5.4 shows a water chemistry comparison between upstream and downstream locations associated with the plant by presenting the averaged values of maximum concentrations of selected parameters (i.e., for locations with multiple sample stations, the maximum value from each station is averaged; for locations with only one sample station, the maximum value is presented). Only the parameters that had

Table 5.4. Selected Routine Nonradiological Surface Water Surveillance Maximum Average Results for CY 2012*

Parameter (mg/L) Except Where Noted	Up-stream Bayou[1]	Bayou near Site[2]	Down-stream Bayou[3]	Little Bayou near Site[4]	Down-stream Little Bayou[5]	C-746-K Landfill[6]	Up-stream Ohio[7]	Down-stream Ohio[8]	Massac Creek[9]	Cairo, IL[10]
Alkalinity	35	33	42.5	32.5	40	45	50	30	35	23
Conductivity (µmho/cm)	273	816.2	1,205	608	550	694	378	381	170	401
Dissolved Oxygen	13.01	12.3	12.2	21.4	21.6	14.4	12.06	12.19	12.03	29.08
Flow Rate (MGD)	1.56	3.27	9.39	5.37	2.86	2.2	NR	NR	2.27	NR
pH (Std Unit)	8.1	8.36	7.98	8.37	8.19	8.37	8.25	8.12	8.09	8.21
Temperature (°F)	71.9	74.18	82.9	79.3	77.3	71.8	88.6	83.4	74.4	82.8
Trichloroethene (µg/L)	2	5.8	ND	ND	8.4	ND	ND	ND	ND	ND

*For locations with multiple sample stations, the maximum value from each station is averaged; for locations with only one sample station, the maximum value is presented.

The following footnotes correspond with column titles in Table 5.4. These are groupings of sampling locations in the area described in the title. See Figure 4.4 for sampling locations.

1 = L1 (Background)
2 = C612, C616, L291, S31, K001UP
3 = L5, L6
4 = L10, L194
5 = L11, L12, L241
6 = C-746K-5, 746KTB1A
7 = L29A (Background)
8 = L30
9 = L64 (Background)
10 = L306

detected results are shown. The upstream (or background) and downstream results for detected parameters are compared to identify concentrations above background. Sample locations were grouped by geographical locations to ease in these comparisons. For calculation purposes, the maximum concentration for each sampling location within a designated grouping was averaged and reported in Table 5.4. In cases where only one sampling location was utilized for a particular geographical grouping, the yearly maximum result was utilized.

Concentrations of TCE were detected above the laboratory reporting limit in background samples. Since TCE was a commonly used solvent in industrial settings, it is not a contaminant considered to be solely associated with the site. Though TCE was reported at some of the surface water sample locations, only two areas downstream reported concentrations greater than the background sample, with the greatest concentration of TCE being downstream in the Little Bayou Creek area with a maximum average concentration of 8.4 µg/L. This value is the same as 2011. Trending evaluations of TCE concentrations in surface water show a downward trend at most surface water locations impacted by site operations (C-612 appears to have an overall trend upward). Figure 5.1 shows the surface water sampling locations and the TCE trends for locations with TCE detections in 2012.

Metal analysis in surface water surveillance samples was removed from the 2011 EMP and remained the same in the 2012 EMP. Removal of these analyses was based upon reviews of data sets from extensive sampling campaigns. The reviews of those data sets indicated acceptable concentration levels in the surface water samples. With no anticipation of an increase in metal contaminants originating from site operations, the metals analysis was removed from the EMP program.

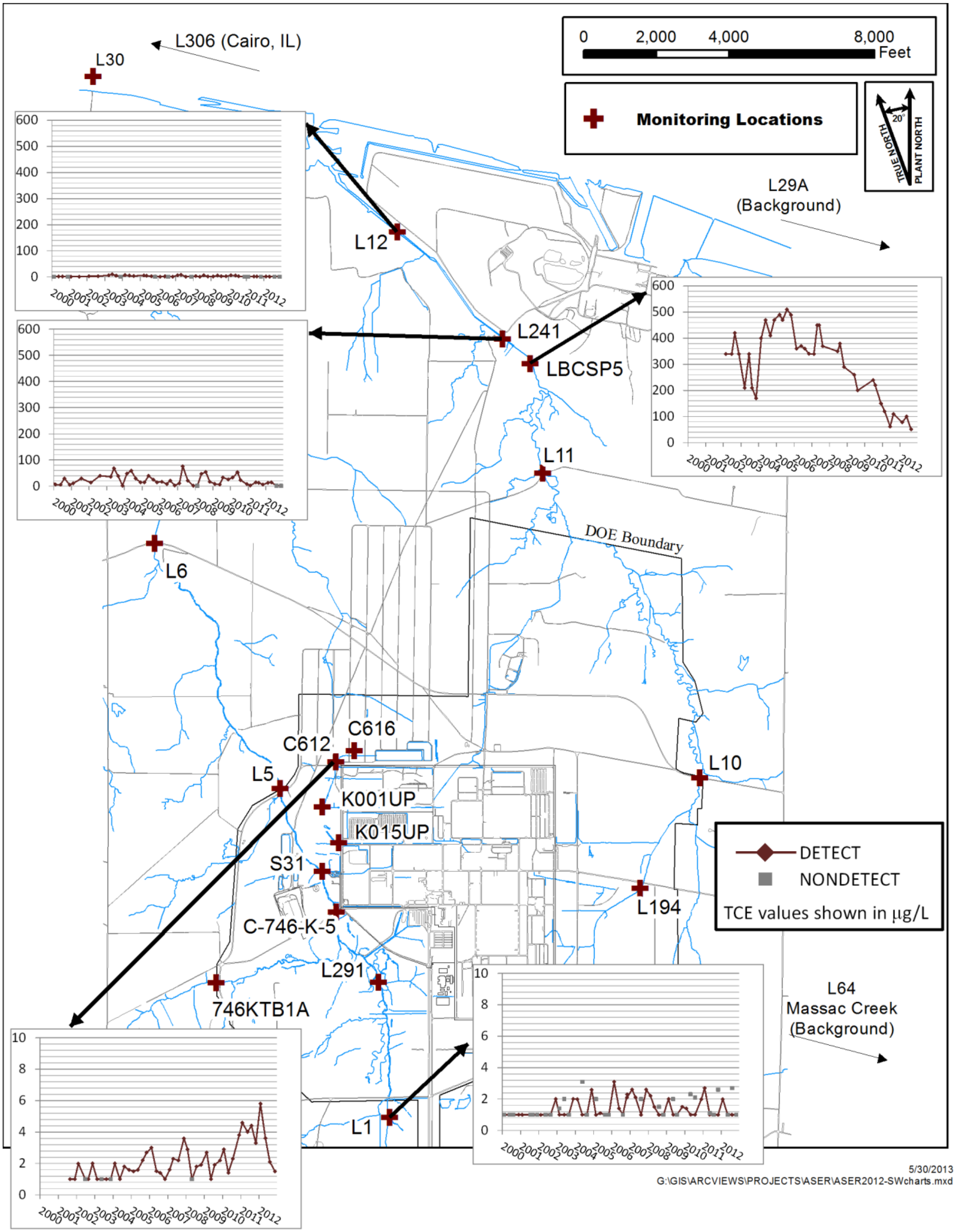

Figure 5.1. Surface Water and Seep Monitoring Locations with TCE Trends

Table 5.5 presents the maximum concentrations of all parameters for the seep sampling location. Results were compared to the Downstream Little Bayou results, which are in Table 5.4, since this location is downstream of the seep locations. The only parameter that was significantly different as a result of this comparison was TCE, in that it was lower than last year; however, the TCE results do not vary greatly compared to previous year's reports. Although the maximum seep result for TCE concentration is relatively high (100 µg/L), immediately downstream of the seep at surface water sampling location L241, the TCE yearly maximum was 15.0 µg/L. Farther downstream at location L12, the TCE concentrations were less than 5 µg/L (see Figure 4.4). For TCE, the surface water standard under the KPDES permit (Table 5.1) is 30.8 µg/L. For comparison purposes, therefore, the TCE concentration immediately downstream of the seep is well below effluent discharge limit.

Additional data are presented in Tables C.4.1 through C.4.20, of Appendix C of this report.

Table 5.5. Selected Routine Nonradiological Surface Water Seep Sampling Results Maximum for CY 2012*

Parameter	LBCSP5
Alkalinity (mg/L)	18
Conductivity (µmho/cm)	332
Dissolved Oxygen (mg/L)	3.62
pH (Std Unit)	7.49
Temperature (°F)	64.9
Trichloroethene (µg/L)	100

*Seep sampling is representative of groundwater. Seep sampling results are compared to groundwater MCLs for evaluation. Sample results for TCE at a surface water location downstream of the seeps at L241 showed levels less than the KPDES permitted level.

Sediment

Sediment is an important constituent of the aquatic environment. If a pollutant is a suspended solid or is attached to suspended sediment, it can settle to the bottom (thus creating the need for sediment sampling), be taken up by certain organisms, or become attached to plant surfaces. Pollutants transported by water can absorb either on organic and inorganic solids or be assimilated by plants and animals. Suspended solids, dead biota, and excreta settle to the bottom and become part of the organic substrata that supports the bottom dwelling community of organisms. Sediments can play a significant role in aquatic ecological impacts by serving as a repository for radioactive or chemical substances that pass via bottom-feeding biota to the higher trophic levels.

Sediment Surveillance Program

Creek and ditch sediments are sampled semiannually as part of a nonradiological environmental surveillance program. Sediment samples were taken from 14 locations in CY 2012 (Figure 5.2). Sediments were sampled for the parameters listed in Table 5.6.

Sediment Surveillance Results

Table 5.7 shows a comparison between upstream and downstream locations associated with the plant by presenting the averaged values of maximum concentrations of selected parameters. Only the parameters that had detected results are shown. The upstream (or background) and downstream results for detected parameters are compared to identify concentrations above background. Sample locations were grouped by geographical locations to facilitate these comparisons. For calculation purposes, the maximum

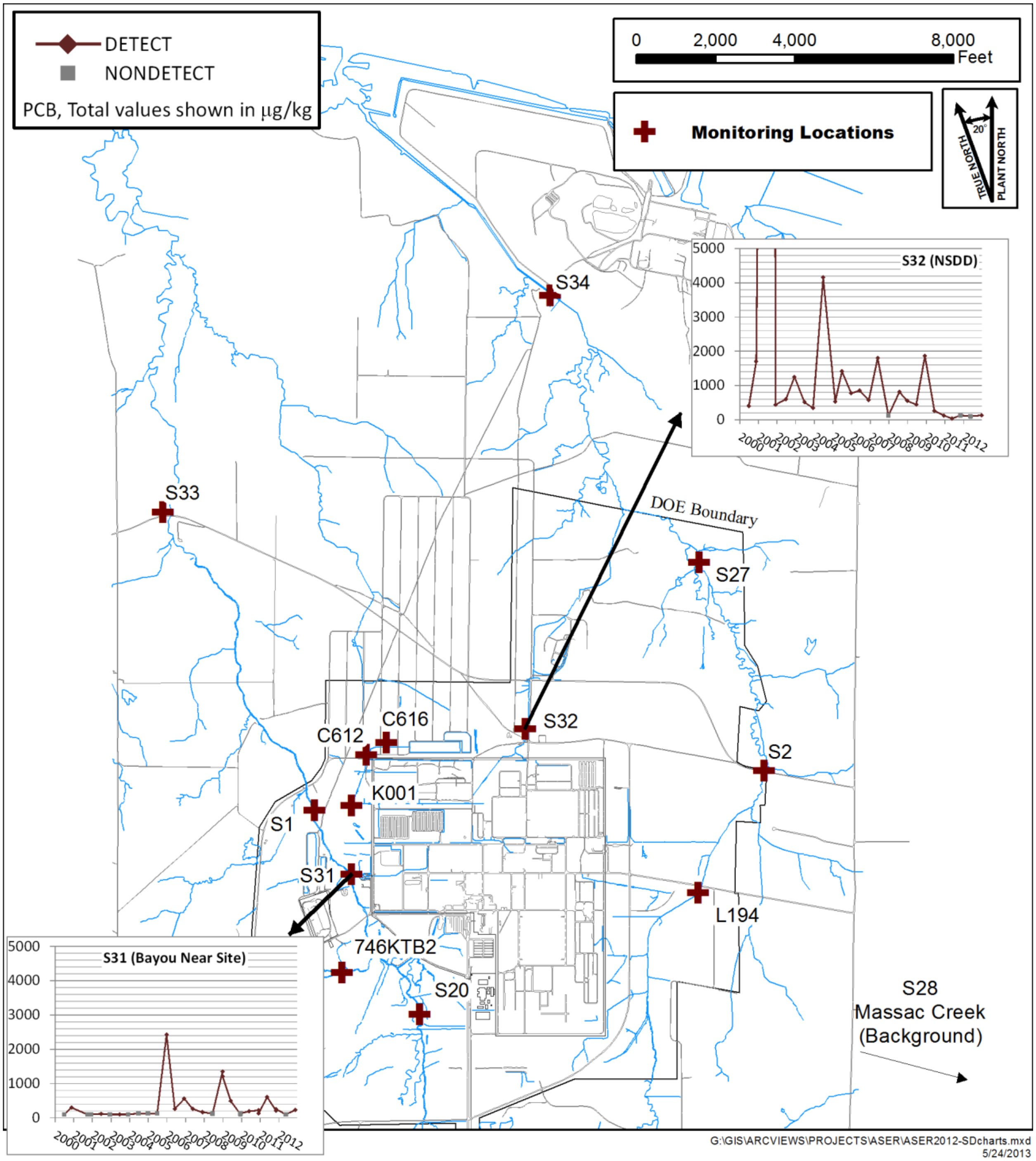

Figure 5.2. Sediment Monitoring Locations with PCB, Total Trends

concentration for each sampling location within a designated grouping was averaged and reported in Table 5.4. In cases where only one sampling location was utilized for a particular geographical grouping, the yearly maximum result was utilized.

Table 5.6. Semiannual Nonradiological Parameters for Sediment Samples

Parameter	
PCB, Total	PCB-1248
PCB-1016	PCB-1254
PCB-1221	PCB-1260
PCB-1232	PCB-1268
PCB-1242	

Table 5.7. Selected Routine Nonradiological Sediment Surveillance Maximum Average Results for CY 2012*

Parameter (µg/kg)	Upstream Bayou[1]	Bayou Near Site[2]	Downstream Bayou[3]	Little Bayou Near Site[4]	Downstream Little Bayou[5]	C-746-K Area[6]	NSDD[7]	Massac Creek[8]
PCB-1260	ND	230	ND	ND	ND	ND	130	ND
PCB, Total	ND	230	ND	ND	ND	ND	130	ND

*The results presented in the table are the averages of the highest detected result within the area groupings. Nondetected results are not included in the average.

The following footnotes correspond with column titles in the above table. These are groupings of sampling locations in the area described in the title. See Figure 4.4 for sampling locations.

1 = S20 (Background)
2 = C612, C616, K001, S1, S31
3 = S33
4 = S2, L194
5 = S27, S34
6 = 746KTB2
7 = S32
8 = S28 (Background)

PCBs were found in the NSDD and Bayou Creek near the plant site. The highest levels were near the plant site in Bayou Creek. The only PCB congener present was PCB-1260. Additional sediment data are presented in Tables C.4.21 through C.4.34, of Appendix C of this report. The PCB-contaminated areas either are within the DOE-controlled area or are posted for protection of the public. No regulatory criteria are established for any parameters for the sediment matrix; however, a comparison of the results is made to previous year's reports for trending purposes. Figure 5.2 shows the sediment sampling locations and the PCB trends for locations with PCB detections in 2012.

Metal analysis in sediment surveillance samples was removed from the 2011 EMP and remained the same for the 2012 EMP. Removal of these analyses was based upon reviews of data sets from extensive sampling campaigns. The reviews of those data sets indicated acceptable concentration levels in the sediment samples. With no anticipation of an increase in metal contaminants originating from site operations, the metals analysis was removed from the EMP program.

Soil

The major source of soil contamination is deposition from air pathways. Because DOE no longer operates any major air emission sources, routine soil surveillance is not performed; however, surface soil contamination at the Paducah Site is being addressed by the Soils OU (see Environmental Restoration Program in Chapter 3).

Vegetation

Because DOE no longer operates any major air emission sources, routine vegetation surveillance activities are not performed.

Terrestrial Wildlife

Deer Harvest

DOE notified Kentucky Department of Fish and Wildlife Resources in July 2011 that it was ceasing deer harvesting from the Paducah Site (DOE 2011d). The lack of detection for some contaminants, such as PCBs in deer liver, was the basis for the elimination. PCB levels have been below levels the Food and Drug Administration considers safe to protect human health. In addition, a comparison of the metals detected in the deer with average chemical data from background deer collected shows no chemicals significantly above background. Remediation efforts performed by DOE and its contractors are working to control/eliminate contaminant sources at the site. Recreational activities were expanded in the DOE-owned land in the WKWMA in 2012. Expanded activities included youth turkey hunting, horseback riding, hiking, dog training and trials, gun hunting for small game, increased bow hunting for deer, mountain biking, and nature hiking. The expansion took effect January 1, 2012, after a new five-year license agreement was signed between the Kentucky Department of Fish and Wildlife Resources and DOE, but most activities were not implemented until the fall 2012 hunting season.

Aquatic Life

Starting in 1987, aquatic or biological monitoring of Bayou Creek and Little Bayou Creek had been conducted following guidelines set forth in the Watershed Monitoring Plan (WMP). Requirements set forth in the WMP followed conditions in the KPDES permit, as well as best management practices. Initially, those conditions required fish and benthic macroinvertebrate in the receiving creeks, as well as chronic and acute toxicity sampling at the KPDES outfalls. After years of collecting fish and benthic macroinvertebrate samples, KDOW issued a new KPDES permit eliminating the requirements for the fish and benthic macroinvertebrate sampling; however, the chronic and acute toxicity sampling remained a KPDES permit condition. Using a conservative approach, DOE continued the benthic macroinvertebrate sampling efforts through 2010. Benthic macroinvertebrate sampling was eliminated in 2011. Chronic and acute toxicity sampling remain in the KPDES permit and in the WMP.

Warning signs along Bayou and Little Bayou Creeks remain to warn members of the public about the possible risks posed by recreational contact with these waters, stream sediments, and fish caught in the creeks.

6. GROUNDWATER PROTECTION PROGRAM

The primary objectives of groundwater monitoring at the Paducah Site are to detect contamination and provide the basis for groundwater quality assessments, if contamination is detected. Monitoring includes the exit pathways at the perimeter of the plant and off-site water and monitoring wells (MWs). Primary off-site contaminants continue to be TCE, an industrial degreasing solvent, and Tc-99, a fission by-product. Evidence suggests the presence of TCE as a DNAPL in groundwater beneath the site.

6.1 INTRODUCTION

Monitoring and protection of groundwater resources at the Paducah Site are required by federal and Commonwealth of Kentucky regulations and by DOE Orders. Groundwater is not used for on-site purposes and when off-site contamination from the Paducah Site was discovered in 1988, DOE provided an alternate water supply to affected residences.

A CERCLA/ACO SI, completed in 1991, determined the primary off-site contaminants in the RGA to be TCE and Tc-99. TCE was used until 1993 as an industrial degreasing solvent and Tc-99 is a fission by-product contained in nuclear power reactor returns that were brought on-site through 1976 for reenrichment of U-235 (DOE 2001). Such reactor returns no longer are used in the enrichment process; however, Tc-99 still is present in the system. Known or potential sources of TCE and Tc-99 include former test areas, spills, leaks, buried waste, and leachate derived from contaminated scrap metal.

Investigations of the on-site source areas of TCE at the Paducah Site are ongoing. The main source of TCE contamination in the groundwater is near the C-400 Cleaning Building. TCE has a low solubility and a higher density than water, which are common characteristics of DNAPLs. DNAPLs typically sink through the subsurface and may form pools in less permeable layers of the subsurface, as well as the base of the aquifer. This physical nature of DNAPLs makes treatment difficult because these pools constitute a continuous source of dissolved-phase contamination (i.e., plumes) deep within the aquifer. The highest concentration of DNAPL at the Paducah Site is associated with past activities at C-400.

Groundwater monitoring serves to detect the nature and extent of contamination (types of contaminants, concentration of contaminants) and to determine the movement of groundwater near the plant. Data obtained from the monitoring supports the decision-making process for the ultimate disposition of the contaminants. Figure 6.1 presents monitoring wells sampled in CY 2012 and shows the 2012 TCE plume associated with PGDP (LATA Kentucky 2013d). Section 6.6 further describes the plumes associated with PGDP.

For access to historical groundwater data, visit the PEGASIS Web site at http://padgis.latakentucky.com/padgis/ to view data for over 150 MWs and groundwater locations at PGDP. Additional information regarding PEGASIS is found in Section 3.6 and Section 7.4.

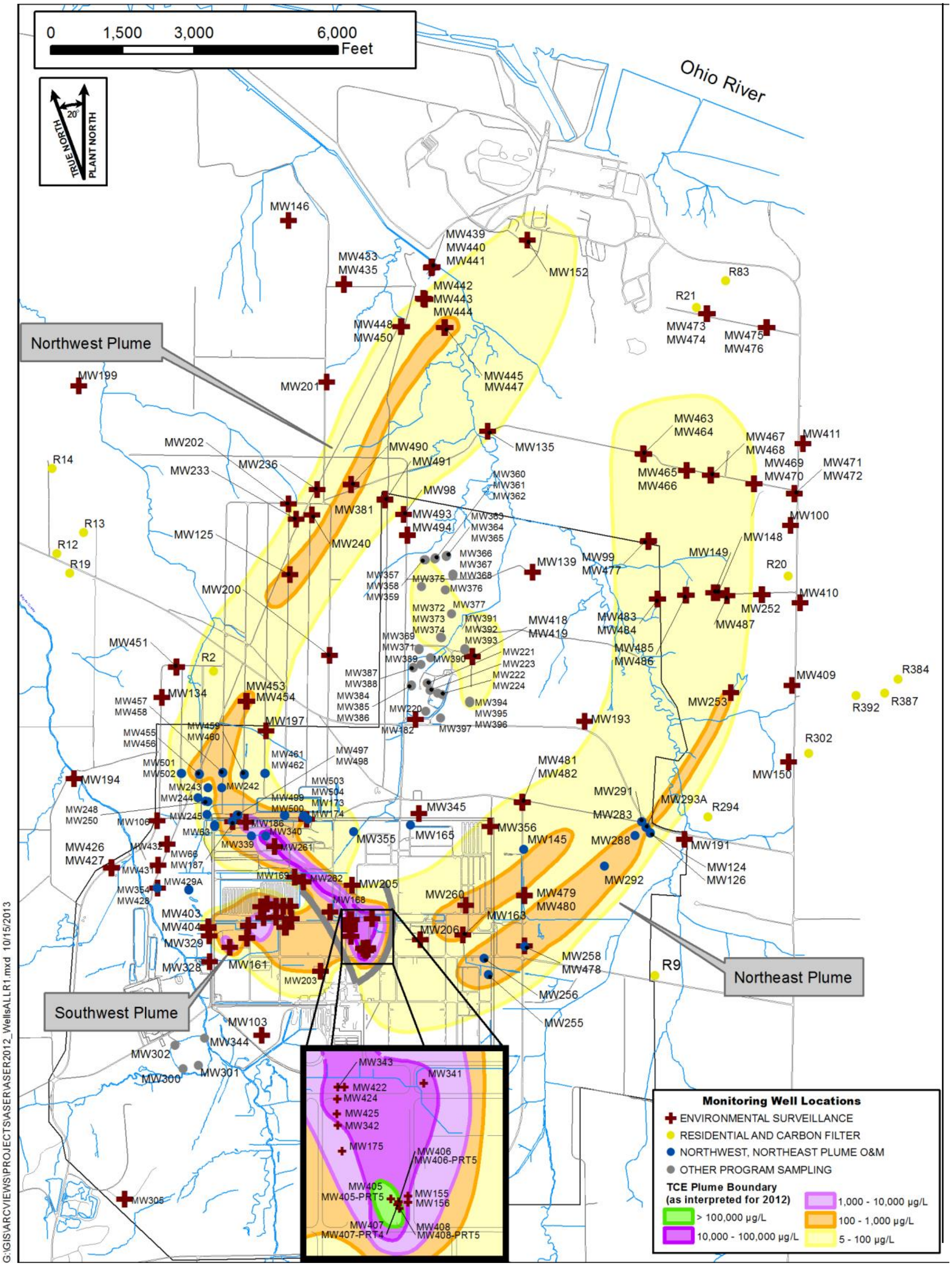

Figure 6.1. Monitoring Wells Sampled in CY 2012 (2012 TCE Plume Shown)

6.2 GROUNDWATER HYDROLOGY

When rain falls to the ground, some of it flows across the surface eventually entering streams or lakes, some of it is used by plants, some evaporates and returns to the atmosphere, and some sinks into the ground. The water that sinks into the ground infiltrates the spaces between the particles of soil and rock. Groundwater is stored in and moves slowly through an aquifer. Aquifers typically consist of layers of sand and gravel or porous (sometimes fractured) rock. The speed that groundwater flows through the subsurface depends on the porosity of the soil/rock, and how well the spaces are connected. Hydraulic conductivity is the physical property that describes the ease with which water can move through the pore spaces and fractures in soil, gravel, sand, and rock.

The area in the subsurface where water fills these pore spaces is called the saturated zone (Figure 6.2). The top of the saturated zone is the water table, which is the boundary between the unsaturated and saturated zones. This boundary generally gently mirrors the surface topography and is lowest at natural exits such as springs, swamps, and beds of gaining streams and rivers. Groundwater can be brought to the surface naturally, either through discharge as a spring or as flow into lakes and streams, or it can be extracted through a well drilled into the aquifer. A well is a pipe/screen assembly in the ground that fills with groundwater, which then can be brought to the surface using a pump.

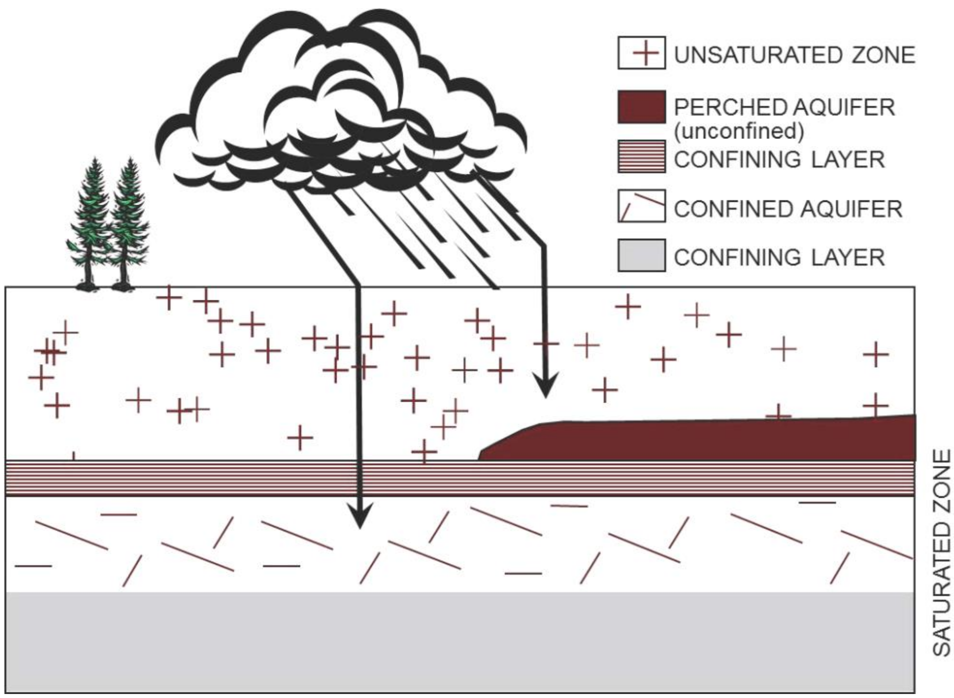

Figure 6.2. Typical Path for Rainwater Accumulation as Groundwater

MWs are used extensively at the Paducah Site to assess the effect of plant operations on groundwater quality. Wells positioned to sample groundwater flowing away from a site are called downgradient wells, and wells placed to sample groundwater flowing toward a site are called upgradient wells. Any contamination present in wells downgradient from a site that is not present in wells upgradient of that site may originate at the site in question.

Groundwater movement is determined by differences in the elevation of the top of the groundwater column at a specific location compared to the elevation elsewhere. This is called hydraulic head. Hydraulic head is considered to be the total energy in any water mass resulting from three components:

pressure, velocity, and elevation. Water will rise in a well casing in response to the pressure of the water surrounding the well's screened zone. The depth to water in the well is measured and the elevation calculated to determine the hydraulic head of the water in the monitored zone (Figure 6.3). The hydraulic gradient measures the difference in hydraulic head over a specified distance. By comparing the water levels in adjacent wells screened in the same zone, a horizontal hydraulic gradient can be determined and the lateral direction of groundwater flow can be predicted.

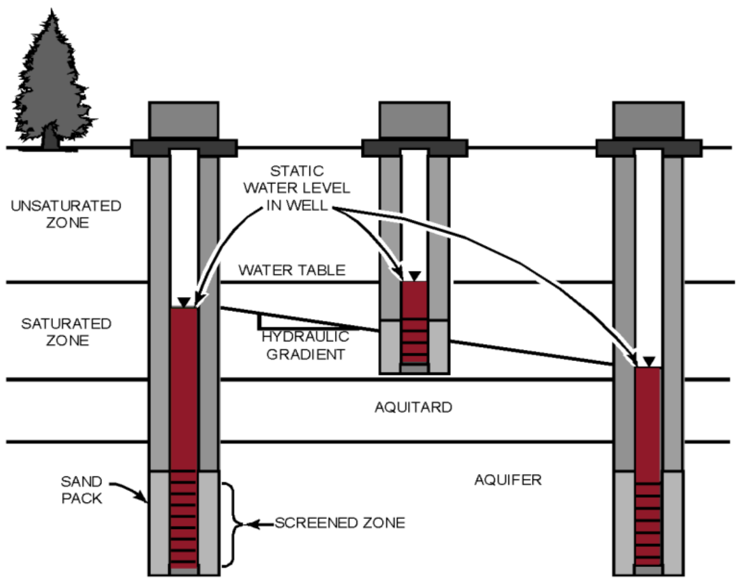

Figure 6.3. MW Construction Showing the Relationship between the Screened Zone and the Water Level in Wells where Flow in the Aquifer Is to the Right

Only wells screened in the same zones are considered when determining the horizontal gradient. Wells screened above and below an aquitard (a geologic unit that inhibits groundwater flow) can have different hydraulic heads, thus defining a vertical gradient. If the water levels in deeper wells are lower than those in shallower wells, then the flow is through the aquitard and primarily downward.

Groundwater aquifers are one of the primary pathways by which potentially hazardous substances can spread through the environment. Substances in the soil may migrate downward due to gravity or be dissolved in rainwater, which transports them downward through the unsaturated zone into the aquifer. The contaminated water then flows laterally downgradient toward the discharge point.

6.3 GEOLOGIC AND HYDROGEOLOGIC SETTING

The Paducah Site, located in the Jackson Purchase region of western Kentucky, lies near the northern boundary of the Mississippi Embayment portion of the Gulf Coastal Plain Province. The Mississippi embayment is a large sedimentary trough oriented nearly north-south that received sediments during the Cretaceous and Tertiary geologic time periods.

During the Cretaceous Period, the PGDP area was a coastal marine environment. The derived sediments constitute a thick deposit of fine sand beneath PGDP (270 ft), with frequent lenses of silt and clay in the upper part that is called the McNairy Formation. A similar depositional environment continued into the early Paleocene Epoch. These sediments, indistinguishable in lithologic sample from the McNairy Formation, are named the Clayton Formation. (PGDP geologists commonly refer to the collective Cretaceous and lower Paleocene sediments as the McNairy Formation.)

Throughout most of the Mississippi Embayment and extending to under the south side of the PGDP, the Paleocene Porters Creek Clay overlies the McNairy/Clayton Formation. Locally, the Porters Creek Clay consists predominately of silt with sand and clay interbeds that were deposited in marine and brackish water environments. Much later erosion, associated with formation of the ancestral Tennessee River basin, thinned the Porters Creek Clay to the north and completely removed it under most of the PGDP and adjacent area to the north. The McNairy and Clayton Formations and the Porters Creek Clay uniformly dip 30 to 35 ft per mile to the south-southwest.

Pliocene-Pleistocene (the geologic age of these formations is uncertain) gravels (and lesser sands), representing a broad alluvial fan deposit that extended across all of the Jackson Purchase region at one time, overlie the Porters Creek Clay to the south. These gravels constitute the oldest member of the lower continental deposits. The ancestral Tennessee River cut through the PGDP area (close to the present course of the Ohio River) later in the Pleistocene, eroding through the Porters Creek Clay to form a wide valley. A subcrop of the Porters Creek Clay, buried in the sediments beneath the PGDP, marks the south side of the ancestral Tennessee River valley. Braided river deposits of sand and gravel, commonly 30-ft thick, fill the lower portion of the ancestral Tennessee River valley. These sands and gravels form the youngest member of the lower continental deposits.

As sediments from retreating Pleistocene glaciers plugged tributaries to the Mississippi River, lakes formed in the ancestral Tennessee River valley. These lake deposits predominately consisted of silt. Intervals of common sand and gravel lenses within the silt beneath PGDP attest to minor periods of active erosion of the Pliocene-Pleistocene gravels to the south and redeposition within the valley. (The thick silt interval, with interbedded sand and gravel member, is collectively called the Upper Continental Deposits). Finally, layers of loess, wind-blown silt derived from the receding glaciers, blanketed the entire Jackson Purchase region. The combined thickness of upper continental deposits and loess at PGDP is commonly 60-ft thick.

The local groundwater flow systems at the Paducah Site include the following (from shallowest to deepest): (1) the Terrace Gravel flow system, (2) UCRS, (3) RGA, and (4) the McNairy flow system. Additional water-bearing zones monitored at the Paducah Site are the Eocene Sands and the Rubble Zone (i.e., the weathered upper portion of the Mississippian bedrock). These components are illustrated on Figure 6.4.

Groundwater flow originates south of the Paducah Site within Eocene Sands and the Terrace Gravel. Groundwater within the Terrace Gravel discharges to local streams and recharges the RGA. Groundwater flow through the UCRS predominantly is downward, also recharging the RGA. From the plant site, groundwater generally flows northward in the RGA toward the Ohio River, which is the local base level for the system. Flow in the McNairy beneath PGDP also is northward to discharge into the Ohio River.

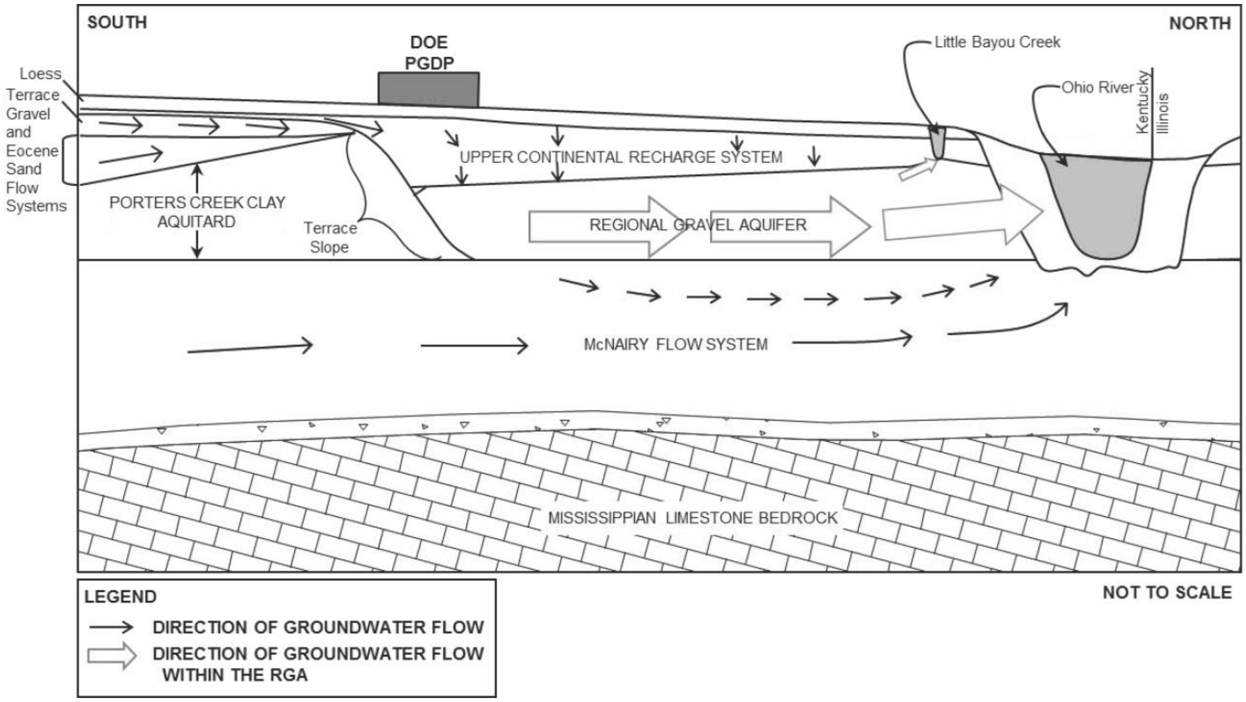

Figure 6.4. Paducah Site Groundwater Flow System

The Terrace Gravel consists of shallow Pliocene-Pleistocene gravel deposits in the southern portion of the Paducah Site. These deposits usually lack sufficient thickness and saturation to constitute an aquifer, but are a locally important source of groundwater recharge to the RGA.

The UCRS consists of the silts, with sand and gravel interbeds, of the upper continental deposits and overlying loess. Groundwater flow within the UCRS is predominately downward and is the primary recharge to the RGA.

The RGA is the uppermost aquifer at the Paducah Site and was used formerly as a drinking water source by private residences north of the site. It consists primarily of the Lower Continental Deposits, a thick unit of sand and gravel formed by the ancestral Tennessee River, and includes contiguous sands and gravels of the Upper Continental Deposits, the McNairy Formation, and alluvium of the Ohio River. Near the Ohio River, alluvium lies adjacent to the URGA. These deposits have an average thickness of 30 ft and can be more than 70-ft thick along an axis that trends east-west through the site. The Ohio River is the regional discharge/drainage feature for the area hydrologic system.

The McNairy flow system is composed of interbedded and interlensing sand, silt, and clay. Near PGDP, the McNairy Formation can be subdivided into three members: (1) a 60-ft thick sand-dominant lower member; (2) a 100- to 130-ft thick middle member, composed predominately of silty and clayey fine sand; and (3) a 30- to 50-ft thick upper member consisting of interbedded sands, silts, clays, and occasional gravel. Sand facies account for 40% to 50% of the total formation thickness of approximately 225 ft.

6.4 USES OF GROUNDWATER IN THE VICINITY

The WKWMA and some lightly populated farmlands are in the immediate vicinity of the Paducah Site. Homes are sparsely located along rural roads in the vicinity of the site. Two communities, Grahamville and Heath, lie within 2 miles east of the plant.

Historically, groundwater was the primary source of drinking water for residents and industries in the vicinity of the plant area. In areas where the groundwater is either known to be contaminated or is suspected of becoming contaminated in the future, DOE has provided water hookups to the West McCracken County Water District and provides water to affected residences and businesses. Residential wells have been capped and locked except for those that are used by DOE for monitoring (per written agreement).

PGDP uses surface water from the Ohio River for process waters and on-site drinking water. The nearest community downstream of Paducah using surface water for drinking water is Cairo, IL, which is located at the confluence of the Mississippi and Ohio Rivers.

6.5 GROUNDWATER MONITORING PROGRAM

The primary objectives of groundwater monitoring at the Paducah Site are early detection of any contamination resulting from past and/or present land disposal of wastes and provision of data that can be used for decision documents, if contamination is detected. Additional objectives outlined in DOE Order 450.1A, *Environmental Protection Program*, require implementation of a sitewide approach for groundwater monitoring.

The sitewide approach is outlined in the following two documents related to groundwater monitoring: (1) Groundwater Protection Plan (LATA Kentucky 2010a); and (2) and the Paducah Site EMP (LATA Kentucky 2011; LATA Kentucky 2012a). Approximately 393 MWs and residential wells were sampled in accordance with DOE Orders and federal, state, and local requirements during 2012. Well sampling is included in several different monitoring programs, which are described in the following subsections.

Resource Conservation and Recovery Act Permit Monitoring Programs

The only hazardous waste facility at the Paducah Site that requires groundwater monitoring is the C-404 Landfill (Figure 6.5). The C-404 Low-Level Radioactive Waste Burial Ground was used for the disposal of uranium-contaminated solid wastes until 1986, when it was determined that, of the wastes disposed of there, uranium/lime precipitation sludge was considered a hazardous waste under RCRA. The landfill was covered with a RCRA-compliant cap and was certified "closed" as a hazardous waste landfill in 1987.

The landfill now is monitored under postclosure monitoring requirements. According to the Kentucky C-404 postclosure permit, 9 wells (MWs 84, 85, 87, 88, 90A, 91, 93, 94, and 420) are monitored semiannually for groundwater quality. Additionally, 11 wells are monitored by DOE that are not required by the C-404 postclosure permit. Four of the 20 wells monitor the UCRS, while 16 of the wells monitor the underlying RGA. The sampling results also are examined with respect to the location of the well relative to the gradient of the RGA. Nine of the 20 wells are considered upgradient of the landfill while the remaining wells are downgradient of the landfill.

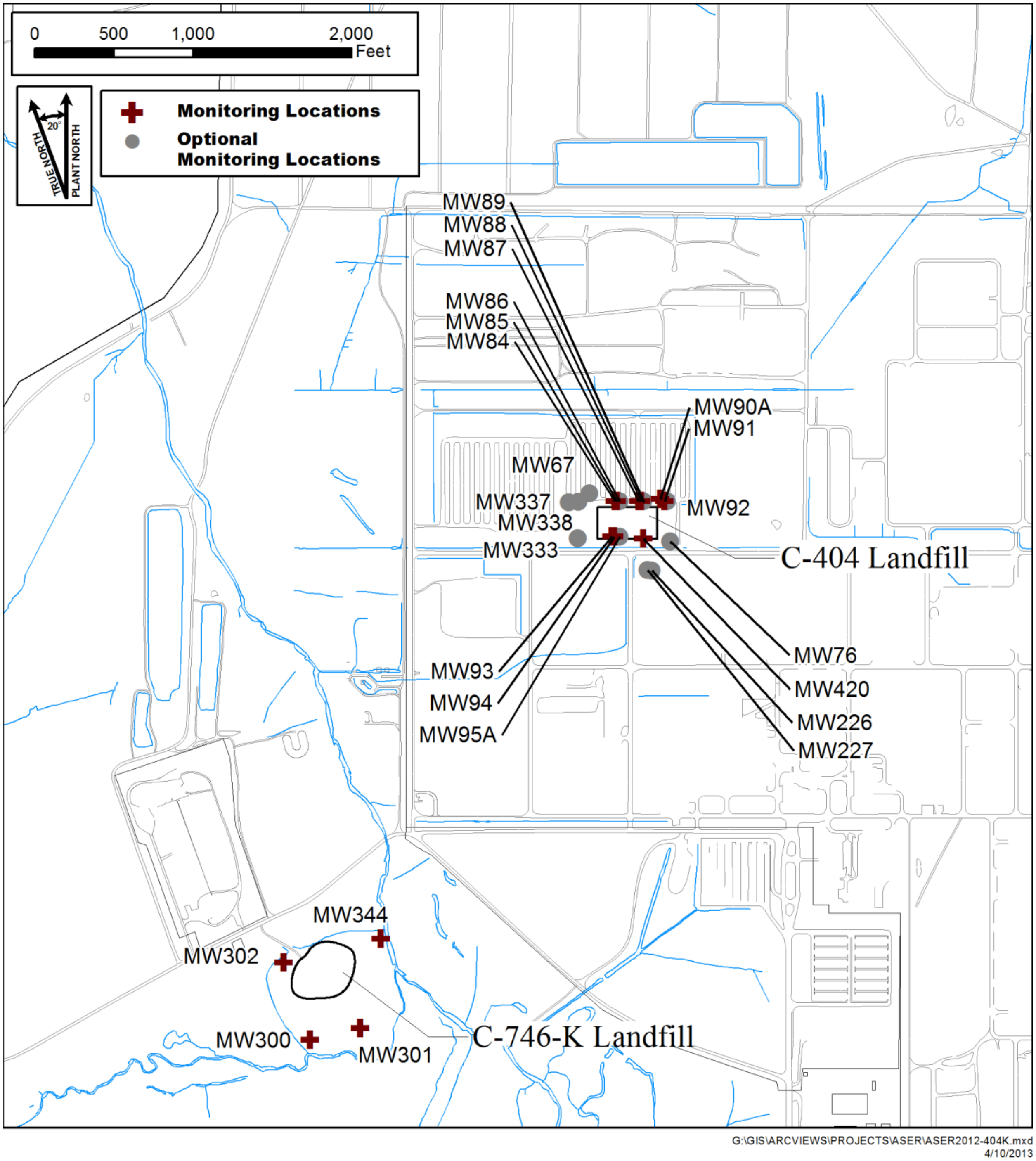

Figure 6.5. MW Locations near the C-404 and C-746-K Landfills

During 2012, MWs at the C-404 Landfill were sampled and analyzed for total and dissolved metals (chromium, arsenic, cadmium, lead, mercury, selenium, and uranium), TCE, Tc-99, U-234, U-235, and U-238. Field parameters (e.g., temperature, pH, depth to water) are collected at the C-404 Landfill MW locations. TCE concentrations in upgradient wells exceeded the MCL in all upgradient wells and in all but one (MW92) of the downgradient wells. Chromium was detected in two downgradient wells (MW87 and MW91) above the MCL. Selenium was detected at one downgradient well (MW91) above the MCL.

Tc-99 exceeded the 900 pCi/L reference value in downgradient well MW91. Exceedances for the permitted monitoring wells are reported to KDWM in semiannual reports, as directed by the permit.

A summary of the detected maximum results for each of the wells is provided in Table 6.1. Parameters with no detections are not listed.

Solid Waste Landfill Groundwater Monitoring Programs

Postclosure groundwater monitoring continues for the C-746-S&T Landfills. The C-746-S Residential Landfill stopped receiving solid waste by July 1, 1995, and was certified closed on October 31, 1995, by an independent engineering firm. The C-746-T Inert Landfill was certified closed in November 1992. The C-746-U Landfill currently is operated as a permitted, contained landfill with a groundwater monitoring program.

The groundwater monitoring system for the C-746-S&T Landfills and the C-746-U Landfill consists of upgradient, sidegradient, and downgradient wells (Figure 6.6). The monitoring system is designed to monitor the LRGA, URGA, and UCRS.

The MWs at C-746-S&T and C-746-U are sampled quarterly and in accordance with 401 *KAR* 48:300. The analytes are dictated by a KDWM-approved solid waste landfill permit modification.

During 2012, beta activity exceeded MCLs in the downgradient wells of three of the well systems (LRGA, URGA, and UCRS) and in the sidegradient wells of the LRGA and URGA at C-746-S&T Landfills. TCE concentrations also exceeded MCLs in some LRGA and URGA wells. The KDWM was notified of the exceedances.

During 2012, beta activity exceeded MCLs in some of the LRGA and URGA wells at C-746-U Landfill. TCE concentrations exceeded MCLs in upgradient and downgradient wells of the LRGA and URGA. The KDWM was notified of the exceedances.

The C-746-S Residential Landfill and the C-746-T Inert Landfill were used at PGDP between 1981 and 1995 for the disposal of trash and garbage (C-746-S) and construction material (C-746-T). Postclosure groundwater monitoring continues for the C-746-S&T Landfills on a quarterly basis. A summary of the maximum results of the LRGA, URGA, and UCRS C-746-S&T Landfills wells is provided in Table 6.2. Selected parameters include only the parameters in which at least one result was reported above the laboratory reporting limits.

The C-746-U Landfill has been used at PGDP since 1996 for the disposal of solid waste. Groundwater monitoring for the C-746-U Landfill is on a quarterly basis. A summary of the maximum results of the LRGA, URGA, and UCRS C-746-U Landfill wells is provided in Table 6.3. Selected parameters include only the parameters in which at least one result was reported above the reporting limits.

The C-746-K Sanitary Landfill was used at the PGDP between 1951 and 1981 primarily for the disposal of fly ash. Postclosure groundwater monitoring continues for the C 746-K Landfill on a semiannual basis. MCL exceedances were found for beta activity, 1,1-dichloroethene, *cis*-1,2-dichloroethene, TCE, and vinyl chloride in groundwater samples collected from the C 746-K Landfill MWs in 2012. Table 6.4 presents a summary of monitoring results for the C-746-K Landfill.

Table 6.1. Summary of Maximum Groundwater Results from the RGA at C-404 Landfill for CY 2012

Parameter	Permitted Wells									Optional Wells											Reference Value[a]
	Upgradient Wells			Downgradient Wells						Upgradient Wells						Downgradient Wells					
	RGA		UCRS	RGA			UCRS			RGA						RGA					
	MW 420	MW 93	MW 94	MW 84	MW 87	MW 90A	MW 85	MW 88	MW 91	MW 67	MW 76	MW 226	MW 227	MW 333	MW 95A	MW 86	MW 89	MW 92	MW 337	MW 338	
ANION (mg/L)																					
Sulfate	7	7.2	120	7.2	8.2	5.8	12	120	8.1	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	--
METAL (mg/L)																					
Arsenic	ND	0.00535	0.00155	0.00434	0.00187	ND	0.0137	0.0058	0.0101	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.05
Chromium	ND	0.0214	0.014	ND	**0.0792**	ND	ND	0.0153	**0.708**	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.05
Iron	ND	4.42	4.84	0.721	4.44	ND	0.212	4.07	6.41	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	--
Lead	ND	0.00229	0.00361	ND	0.00279	ND	ND	0.00285	0.00283	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.05
Manganese	ND	0.546	0.202	0.0489	0.349	0.00835	ND	0.0434	0.0236	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	--
Selenium	ND	ND	ND	ND	ND	ND	ND	ND	**0.0145**	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.01
Uranium	ND	ND	0.00333	ND	ND	ND	ND	ND	ND	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	--
METAL-D (mg/L)																					
Arsenic, Dissolved	ND	0.00377	ND	0.0042	0.00132	ND	0.013	0.00555	0.00228	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	--
Chromium, Dissolved	ND	ND	ND	ND	ND	ND	ND	ND	0.0176	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	--
Selenium, Dissolved	ND	ND	ND	ND	ND	ND	ND	ND	0.00618	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	--
Uranium, Dissolved	ND	ND	0.00282	ND	ND	ND	ND	ND	ND	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	--
PHYSICAL PARAMETERS																					
Depth to Water (ft)	53.2	53.1	15.4	51.7	51.7	50.2	12.9	11.8	11.8	50.8	52.3	54.2	54.3	52.5	52.4	51.8	51.6	50.6	50.3	50.6	--
Dissolved Oxygen (mg/L)	1.11	1.13	0.88	2.5	1.96	4.19	3.74	1.14	3.46	5.68	1.18	0.9	5.09	1.8	1.17	2.28	2.46	1.43	6.59	5.91	--
pH (Std Unit)	6.7	6.08	6.36	6.47	6.25	7.24	6.54	5.89	5.96	5.98	6.01	6.05	6.14	6.05	6.11	6.13	6.09	5.92	5.97	5.89	--
Redox (mV)	831	620	614	685	631	821	767	613	609	499	558	698	612	518	557	465	484	778	527	486	--
Temperature (°F)	70.7	68.7	71.1	68.6	71.5	69.9	69	71.8	70.8	69.1	69.7	68.8	67.8	69	68.9	70.4	71	67.6	69.4	70.7	--
RADS (pCi/L)																					
Technetium-99	32.6	7.15[b]	715	22.3	3.75[b]	15.1[b]	143	29.4	**2,870**	110	82.8	74.7	17.9	33.7	10.8[b]	1.86[b]	6.83[b]	5.28[b]	324	18	900
Uranium-234	0.665[b]	0.000[b,c]	1.51	0.00516[b]	0.0913[b]	0.547[b]	0.539[b]	0.0595[b]	0.248[b]	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	--
Uranium-238	0.135[b]	0.0197[b]	1.28	0.0145[b]	0.039[b]	0.129[b]	1.81	0.0528[b]	0.198[b]	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	--
VOLATILE ORGANIC ANALYTE (µg/L)																					
Trichloroethene	**280**	**1,500**	**6.4**	**1,300**	**540**	**24**	**7**	**26**	**86**	**1,500**	**550**	**680**	**150**	**6,300**	**810**	**1,200**	**18**	3.2	**1300**	**170**	5
WET CHEMISTRY PARAMETERS																					
Conductivity (µmho/cm)	284	313	1051	317	280	208	396	601	549	290	351	357	262	413	277	323	214	156	300	232	--
Total Organic Carbon (mg/L)	ND	ND	3.7	ND	ND	ND	ND	2.6	1.4	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	--
Turbidity (NTU)	7.9	90.5	138	9.1	32.6	12.1	8.7	225	245	62.4	9.1	208	41.1	140	6.8	94.4	180	31.4	151	30.6	--

[a] Reference values are from 40 *CFR* § 264.94 except for TCE and Tc-99. TCE reference value is from the EPA MCL. Tc-99 reference value is from EPA's interpretation of the 4 mrem/year MCL.
[b] Results for this location all are reported at activities less than the laboratory's minimum detectable activity and/or radiological uncertainty.
[c] Consistent with NRC guidance, 0.000 is presented for results reported less than zero.
Bold = Exceeds criteria.
-- = No reference value for this parameter.
Shaded areas represent no value.

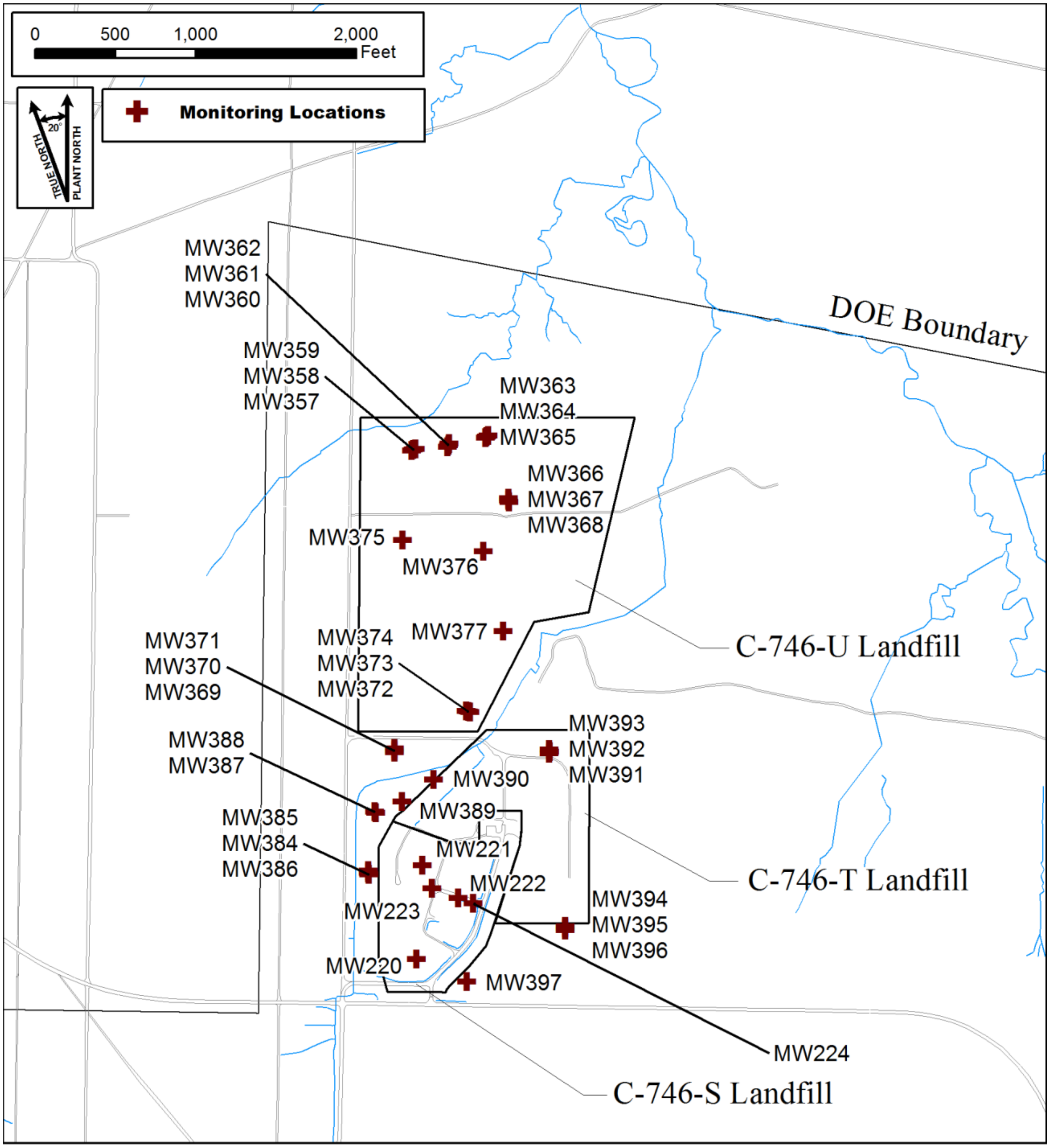

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Figure 6.6. MW Locations near the C-746-S&T and C-746-U Landfills

Table 6.2. Summary of Maximum Groundwater Results at C-746-S&T Landfills for CY 2012

Parameter	LRGA			URGA			UCRS Wells			Value[a]
	Down-gradient	Side-gradient	Up-gradient	Down-gradient	Side-gradient	Up-gradient	Down-gradient	Side-gradient	Up-gradient	
ANION (mg/L)										
Bromide	ND	ND	ND	ND	ND	ND	ND	ND	2.1	--
Chloride	50	33	54	46	70	55	120	21	96	--
Fluoride	0.31	0.23	0.14	0.85	0.3	0.2	0.28	0.63	0.53	4
Nitrate as Nitrogen	1.3	ND	1.7	1.2	1.4	1.6	3.2	ND	ND	10
Sulfate	240	20	12	170	22	17	30	55	20	--
METAL (mg/L)										
Aluminum	ND	ND	ND	0.374	0.386	0.545	1.14	ND	ND	--
Arsenic	0.00179	0.00128	0.00129	0.00309	0.00338	0.00174	0.00534	0.00398	0.00228	0.05
Barium	0.206	0.216	0.262	0.395	0.308	0.251	0.323	0.207	0.448	2
Boron	1.92	ND	ND	1.44	ND	ND	ND	ND	ND	--
Calcium	83.4	27.3	28	67	33.4	27.8	38.4	23.3	38.4	--
Chromium	ND	ND	ND	ND	0.0142	0.01	0.0157	ND	ND	0.1
Cobalt	ND	ND	ND	0.0245	0.00239	0.00243	0.00105	0.00743	0.00207	--
Iron	1.41	0.118	0.14	2.2	0.75	0.656	3	4.89	1.76	--
Lead	0.00149	ND	ND	ND	0.00268	ND	ND	ND	ND	0.05
Magnesium	32	9.64	11.5	25.7	12.4	11.4	16.4	9.89	16.9	--
Manganese	0.305	ND	ND	0.244	0.0449	0.0209	0.0384	0.979	0.451	--
Molybdenum	0.00102	ND	ND	ND	0.00549	0.00211	0.0015	ND	ND	--
Nickel	ND	ND	ND	0.0101	0.386	0.177	ND	0.0053	ND	--
Potassium	3.21	1.62	1.81	2.59	1.81	3.55	0.537	0.38	0.86	--
Selenium	0.0058	ND	0.00745	0.00673	0.0109	0.00657	0.0106	ND	0.00797	0.05
Sodium	67.4	42.3	33.4	128	57.9	40.5	95.4	114	109	--
Uranium	ND	ND	ND	0.00207	ND	ND	ND	ND	ND	--
Zinc	ND	0.0677	ND	ND	ND	ND	ND	ND	ND	--
METAL-D (mg/L)										
Barium, Dissolved	0.201	0.205	0.265	0.374	0.315	0.255	0.312	0.194	0.417	--
Chromium, Dissolved	ND	ND	ND	ND	0.0118	ND	ND	ND	ND	--
Uranium, Dissolved	ND	ND	ND	0.00211	ND	ND	ND	ND	ND	--
PHYSICAL PARAMETERS										
Depth to Water (ft)	44.27	45.14	65.05	50.48	74	59.12	36.42	21.52	16.32	--
Dissolved Oxygen (mg/L)	4.58	3.87	6.87	5.25	6.12	6.23	5.11	1.68	1.23	--
pH (Std Unit)	6.59	6.71	6.23	7.39	6.47	6.28	6.74	6.92	6.55	--
Redox (mV)	748	574	767	883	863	830	796	368	456	--
Temperature (^oF)	69	68.2	69.5	76.2	69.9	68.7	66.7	68.6	68.8	--
POLYCHLORINATED BIPHENYLS (µg/L)										
PCB-1260	ND	ND	ND	ND	ND	0.14	ND	ND	ND	--
RADS (pCi/L)										
Alpha activity	7.07	5.73	2.43[b]	7.41[b]	7.19	3.1[b]	9.11	2.82[b]	5.18[b]	15
Beta activity	**84**	**144**	18.1	**197**	**228**	18.5	**67.6**	6.07[b]	5.29[b]	50
Technetium-99	94.6	152	9.97[b]	192	288	15.9	69.5	0.000[b,c]	8.19[b]	900
Thorium-230	0.265[b]	0.0302[b]	0.165[b]	4.16	1.13	0.0366[b]	0.0297[b]	2.37	0.048[b]	--
VOLATILE ORGANIC ANALYTE (µg/L)										
Trichloroethene	**19**	ND	**5.2**	**15**	ND	**9.9**	ND	ND	ND	5
WET CHEMISTRY PARAMETERS										
Chemical Oxygen Demand (mg/L)	ND	ND	ND	ND	ND	ND	ND	55	28	--
Conductivity (µmho/cm)	982	494	402	855	579	402	822	660	836	--
Dissolved Solids (mg/L)	643	221	224	536	313	232	454	443	480	--
Total Organic Carbon (mg/L)	2.2	ND	ND	2.1	1.2	ND	4.5	25.1	7.4	--
Total Organic Halides (µg/L)	69.2	14	19.1	143	25.1	25	39.6	303	850	--
Turbidity (NTU)	36	31.6	88.7	74.6	95.1	46.6	37	6.5	94	--

[a] Maximum groundwater contaminant levels are for 401 *KAR* 47:030, except for Tc-99. The MCL for arsenic under the Safe Drinking Water Act is higher than 401 *KAR* 47:030. The lower of the two standards is posted as reference value. Tc-99 reference value is from EPA's interpretation of the 4 mrem/year MCL.

[b] Results for this location all are reported at activities less than the laboratory's minimum detectable activity and/or radiological uncertainty.

[c] Consistent with NRC guidance, 0.000 is presented for results reported less than zero.

Bold = Exceeds criteria.

-- = No reference value for this parameter; shaded areas represent no reference standard for comparison.

LRGA downgradient wells are MW370, MW373, MW388, and MW392; LRGA sidegradient well is MW385; LRGA upgradient wells are MW395 and MW397. URGA downgradient wells are MW369, MW372, MW387, and MW391; URGA sidegradient wells are MW221, MW222, MW223, MW224, and MW384; URGA upgradient wells are MW220 and MW394. UCRS downgradient wells are MW389, MW390, and MW393; UCRS sidegradient well is MW386; UCRS upgradient well is MW396.

Table 6.3. Summary of Maximum Groundwater Results at C-746-U Landfill for CY 2012

Parameter	LRGA			URGA			UCRS Wells			Reference Value[a]
	Down-gradient	Side-gradient	Up-gradient	Down-gradient	Side-gradient	Up-gradient	Down-gradient	Side-gradient	Up-gradient	
ANION (mg/L)										
Chloride	35	34	48	31	41	46	11	18	98	--
Fluoride	0.18	0.13	0.18	0.27	0.18	0.3	0.39	0.33	0.32	4
Nitrate as Nitrogen	1	ND	1.3	3.7	ND	ND	1.2	5	2.2	10
Sulfate	97	36	240	70	43	170	74	95	15	--
METAL (mg/L)										
Aluminum	ND	ND	ND	ND	ND	ND	3.15	6.5	ND	--
Arsenic	0.00121	0.00333	0.00133	ND	0.00115	0.00207	0.00133	ND	0.002	0.05
Barium	0.0831	0.193	0.204	0.196	0.189	0.395	0.119	0.23	0.189	2
Boron	0.401	ND	1.92	0.413	ND	1.44	ND	ND	ND	--
Calcium	36.3	23.7	83.4	28.8	28.1	67	24.9	29.3	31	--
Cobalt	0.00311	0.00367	ND	0.00979	0.00126	0.0245	0.00346	ND	ND	--
Iron	0.873	12.9	0.124	2.88	0.226	2.2	1.29	5.34	0.309	--
Lead	ND	ND	0.00149	ND	0.0015	ND	0.00255	0.00725	ND	0.05
Magnesium	15.3	10.2	32	11.9	11.6	25.7	11.1	9.9	13	--
Manganese	0.326	1.77	0.0323	0.514	0.113	0.244	0.297	0.0608	0.14	--
Molybdenum	ND	ND	ND	ND	ND	ND	0.00112	0.00133	ND	--
Nickel	ND	ND	ND	ND	ND	0.0101	0.0054	ND	ND	--
Potassium	2.28	2.63	3.21	1.68	1.87	2.59	0.582	0.794	0.511	--
Selenium	0.00526	ND	0.0058	ND	0.00655	ND	ND	0.0106	0.0217	0.05
Sodium	41.7	32.5	67.4	65.7	42.4	128	142	96	130	--
Uranium	ND	ND	ND	ND	ND	0.00207	0.00731	0.00161	0.00202	0.03
METAL-D (mg/L)										
Barium, Dissolved	0.0806	0.191	0.201	0.188	0.177	0.374	0.119	0.229	0.17	--
Uranium, Dissolved	ND	ND	ND	ND	ND	0.00211	0.00793	ND	0.00183	--
PHYSICAL PARAMETERS										
Depth to Water (ft)	49.05	49.33	43.78	48.82	49	42.88	36.18	45.58	28.63	--
Dissolved Oxygen (mg/L)	3.81	1.26	4.21	4.89	2.82	2.86	5.87	9.04	3.75	--
pH (Std Unit)	6.94	6.83	6.41	7.1	6.44	6.81	7.01	7.21	6.86	--
Redox (mV)	856	660	664	819	883	588	702	790	870	--
Temperature (°F)	65.8	66.1	69	68.9	66.2	76.2	65.6	66.1	75.6	--
POLYCHLORINATED BIPHENYLS (µg/L)										
PCB-1242	ND	ND	ND	0.29	ND	ND	0.57	ND	ND	--
PCBs	ND	ND	ND	0.29	ND	ND	**0.57**	ND	ND	0.5
RADS (pCi/L)										
Alpha activity	6.44	4.51[b]	11.2[b]	4.4[b]	5.02[b]	5.21[b]	4.67[b]	4.97[b]	9.15	15
Beta activity	50	42.2	**52.8**	39.7	**55.6**	**77.8**	6.06	6.15[b]	8.17	50
Technetium-99	65.7	40.8	62.6	46.7	66.3	105	8.25[b]	11.3[b]	34.6	900
VOLATILE ORGANIC ANALYTE (µg/L)										
Trichloroethene	**5.2**	1.9	**8**	**6.5**	2.9	**12**	ND	ND	ND	5
WET CHEMISTRY PARAMETERS										
Conductivity (µmho/cm)	551	416	982	475	448	855	750	687	769	--
Dissolved Solids (mg/L)	319	220	643	274	257	536	485	423	450	--
Total Organic Carbon (mg/L)	1	ND	1.1	3.6	ND	2.1	3.9	3.1	2	--
Total Organic Halides (µg/L)	18.1	121	31.4	41.5	17.6	143	39.1	62.2	229	--
Turbidity (NTU)	13.8	38.2	36	22.7	11	22.3	560	23.4	13.3	--

[a] Reference values are MCLs from 401 *KAR* 47:030, except for PCBs and Tc-99. PCBs reference values is the EPA MCL. Tc-99 reference value is from EPA's interpretation of the 4 mrem/year MCL.

[b] Results for this location all are reported at activities less than the laboratory's minimum detectable activity and/or radiological uncertainty.

Bold = Exceeds criteria.

-- = No reference value for this parameter; shaded areas represent no reference standard for comparison.

LRGA downgradient wells are MW358, MW361, and MW364; LRGA sidegradient well is MW367; LRGA upgradient wells are MW370 and MW373. URGA downgradient wells are MW357, MW360, and MW363; URGA sidegradient well is MW366; URGA upgradient wells are MW369 and MW372. UCRS downgradient wells are MW359, MW362, and MW365; UCRS sidegradient wells are MW368, MW375, MW376, and MW377; UCRS upgradient wells are MW371 and MW374.

Table 6.4. Summary of Maximum Groundwater Results at C-746-K Landfill for CY 2012

Parameter	MW300	MW301	MW302	MW344	Reference Value[a]
ANION (mg/L)					
Alkalinity (mg/L)	240	350	220	100	--
Chloride	99	59	7	20	--
Ferrous Iron	230	120	ND	ND	--
Sulfate	2,200	1,600	130	130	--
METAL (mg/L)					
Aluminum	1.65	6.98	ND	4.39	--
Arsenic	0.0044	0.00261	ND	0.00254	0.01
Barium	0.0263	0.0494	0.0597	0.109	2
Calcium	451	514	45.9	48.9	--
Iron	222	163	0.333	7.54	--
Lead	0.00213	0.00646	ND	0.00568	0.05
Magnesium	112	113	25.6	16.2	--
Manganese	25.5	9.63	0.163	0.167	--
Nickel	0.057	0.0179	0.0061	0.00538	--
Potassium	35	42.7	0.337	1.96	--
Sodium	67.1	74.8	71.5	24.6	--
Uranium	0.00172	0.00968	ND	ND	0.03
METAL-D (mg/L)					
Arsenic, Dissolved	0.00424	ND	ND	0.00201	0.01
Barium, Dissolved	0.0196	0.0185	0.0593	0.049	2
Uranium, Dissolved	0.00159	0.00591	ND	ND	0.03
PHYSICAL PARAMETERS					
Depth to Water (ft)	5.86	NR	14.76	27.99	--
Dissolved Oxygen (mg/L)	1.31	8	3.07	1.45	--
pH (Std Unit)	5.76	6.51	6.12	6.22	--
Redox (mV)	429	355	831	513	--
Temperature (°F)	64.9	63.6	61.9	61.1	--
RADS (pCi/L)					
Beta Activity	**80.6**	**58.9**	0.188[b]	5.53[b]	50
VOLATILE ORGANIC ANALYTE (µg/L)					
1,1-Dichloroethane	69	ND	ND	ND	--
1,1-Dichloroethene	**100**	2.1	ND	ND	7
cis-1,2-Dichloroethene	**610**	15	ND	ND	70
Trichloroethene	**7.8**	ND	ND	ND	5
Vinyl chloride	**220**	ND	ND	ND	2
WET CHEMISTRY PARAMETERS					
Conductivity (µmho/cm)	3,280	3,120	735	521	--
Turbidity (NTU)	530	1753	11.2	203	--

[a] Reference values are from EPA MCLs with the exception of lead. The reference value for lead is from 401 *KAR* 47:030. Values shown are for reference only.
[b] Results for this location all are reported at activities less than the laboratory's minimum detectable activity and/or radiological uncertainty.
Bold = Exceeds criteria.
-- = No reference value for this parameter; shaded areas represent no reference standard for comparison.

Residential Monitoring

As stated previously, the hydrologic unit in which residential wells are screened is uncertain; however, most are believed to be RGA wells. Out of the remaining 14 residential wells that are sampled annually, TCE was detected in one well, R2, at 12 µg/L (MCL for TCE is 5 µg/L). Tc-99 was not reported above the minimum detected activity and/or the radiological uncertainty in the residential wells. R26 detected U-238 above the minimum detected activity, at 0.231 pCi/L (an MCL for U-238 converted from the published MCL for uranium is 27 pCi/L). These samples were collected from residential wells that are not operated for consumption.

For one residential well, R424, DOE has provided the residents with a carbon filter treatment system to allow them to have safe drinking water, though technical analyses of the well's location makes it highly improbable that the TCE contamination in this well originated at the Paducah Site. These filters are replaced semiannually, and the groundwater is sampled before and after filter replacement. Before treatment, the groundwater in the well contains TCE above the MCL established by the EPA Safe Drinking Water Act; however, after treatment, the concentrations in the residence drinking water are below the MCL.

Environmental Surveillance Monitoring

Environmental surveillance monitoring is defined as perimeter-exit-pathway (off-site exposure) monitoring and off-site water well monitoring. Environmental surveillance monitoring is conducted in support of DOE Orders and other laws and regulations as addressed in the Paducah Site EMP (LATA Kentucky 2011; LATA Kentucky 2012a).

During 2012, surveillance wells located on and off DOE property were sampled for VOCs, total and dissolved metals, radionuclides, and anions. Additionally, wet chemistry and field parameters were analyzed. Table 6.5 provides a summary of the maximum detected results for each hydrogeologic unit sampled for the surveillance program (RGA, Rubble Zone, and UCRS). Groundwater monitoring was not conducted in the Eocene Sands or the McNairy Formation in 2012. From the routine well monitoring program in the RGA, several parameters were reported as exceeding the MCLs, including the following: radionuclides (alpha and beta activity and Tc-99); and VOCs (including 1,1-dichloroethene, carbon tetrachloride, and TCE). The maximum TCE value reported (from routine monitoring program wells) in the RGA is 1,400,000 µg/L (detected at MW408-PRT5, near the C-400 Cleaning Building, the site of the ERH IRA; TCE levels fluctuate significantly in wells at C-400 because of the proximity of the source zone and short-term durations in the hydraulic gradient and because remediation is ongoing in phases at this site). TCE was not detected in the UCRS in wells monitored under the environmental surveillance program or in the Rubble Zone during CY 2012. During 2012, the maximum Tc-99 value reported (from routine monitoring program wells) in the RGA was 8,320 pCi/L. The contamination in the RGA is being addressed by CERCLA actions for the GWOU (Chapter 3).

Table 6.5. Summary of Maximum Groundwater Results from Environmental Surveillance Monitoring for CY 2012

	Parameter	RGA	Rubble Zone	UCRS	Reference Value[a]
ANION (mg/L)	Alkalinity	170	NR	NR	--
	Chloride	120	NR	NR	--
	Fluoride	0.28	NR	NR	4
	Ferrous Iron	0.84	NR	NR	--
	Nitrate as Nitrogen	**15**	NR	NR	10
	Sulfate	110	NR	NR	--
METAL (mg/L)	Aluminum	0.35	NR	NR	--
	Arsenic	0.00295	NR	NR	0.01
	Barium	0.305	NR	NR	2
	Calcium	47.6	NR	NR	--
	Chromium	**1.05**	NR	NR	0.1
	Cobalt	0.0138	NR	NR	--
	Copper	0.0259	NR	NR	1.3
	Iron	8.52	NR	NR	--
	Lead	0.00158	NR	NR	0.05
	Magnesium	18.1	NR	NR	--
	Manganese	0.528	NR	NR	--
	Molybdenum	0.0277	NR	NR	--
	Nickel	1.01	NR	NR	--
	Potassium	5.16	NR	NR	--
	Selenium	0.0121	NR	NR	0.05
	Silver	0.00189	NR	NR	--

Table 6.5. Summary of Maximum Groundwater Results from Environmental Surveillance Monitoring for CY 2012 (Continued)

	Parameter	RGA	Rubble Zone	UCRS	Reference Value[a]
METAL (mg/L) (Continued)	Sodium	74.1	NR	NR	--
	Zinc	0.151	NR	NR	--
PHYSICAL PARAMETERS	Depth to Water (ft)	64.74	57.44	15.51	--
	Dissolved Oxygen (mg/L)	10.56	0.5	3.83	--
	pH (Std Unit)	7.59	7.19	6.87	--
	Redox (mV)	835	283	234	--
	Temperature (^{o}F)	89.9	61.8	62	--
RADS (pCi/L)	Alpha activity	**19.2**	**17.4**	**24.7**	15
	Beta activity	**4,970**	8.8	**51.1**	50
	Technetium-99	**8,320**	10.1[b]	18.9	900
	Uranium	0.38[b]	0.177[b]	**26.2**	27
VOLATILE ORGANIC ANALYTE (µg/L)	1,1-Dichloroethene	**9.4**	ND	ND	7
	cis-1,2-Dichloroethene	**74,000**	ND	ND	70
	Methane (mg/L)	0.288	NR	NR	--
	Trichloroethene	**1,400,000**	ND	ND	5
WET CHEMISTRY PARAMETERS	Conductivity (µmho/cm)	753	522	867	--
	Dissolved Solids (mg/L)	434	NR	NR	--
	Silica (mg/L)	32	NR	NR	--
	Total Organic Carbon (mg/L)	4.6	NR	NR	--
	Turbidity (NTU)	316	29.7	320	--

[a] Reference values are from EPA MCLs with the exception of lead, Tc-99, and uranium. The reference value for lead is from 401 *KAR* 47:030. Tc-99 reference value is from EPA's interpretation of the 4 mrem/year MCL. The reference value for uranium is converted from the published MCL value of 30 µg/L based on EPA 2001. Values shown are for reference only.
[b] Results for this location all are reported at activities less than the laboratory's minimum detectable activity and/or radiological uncertainty.
Bold = Exceeds criteria.
-- = No reference value for this parameter.
Shaded areas represent no value.

Monitoring Well Rehabilitation

Thirty wells were scheduled for rehabilitation in 2012, but were postponed to 2013. Well rehabilitation removes accumulated biofilm and blocking materials contained within the well and surrounding aquifer using equipment that goes into the well and uses surging techniques. Well pumping equipment is removed for rehabilitation activities and cleaned and reinstalled into the well after rehabilitation activities are completed.

6.6 ENVIRONMENTAL RESTORATION ACTIVITIES

Environmental restoration activities to address groundwater contamination are described in this subsection. These activities are the Northwest Plume Groundwater System IRA, C-400 IRA for VOC contamination in groundwater, the Northeast Plume Containment System IRA, and the final remedial action to address VOC sources for the Southwest Plume. The descriptions within this section reflect monitoring in the area of the environmental restoration activity and do not provide a comprehensive discussion of trends associated with contaminants in these plumes. For additional description of the PGDP plumes, please see *Trichloroethene and Technetium-99 Groundwater Contamination in the Regional Gravel Aquifer for Calendar Year 2012 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (LATA Kentucky 2013d). This document is available from the EIC (see Chapter 3).

The plume maps depict the general footprint of the TCE and Tc-99 contamination in the RGA and convey the general magnitude and distribution of contamination within the plumes. The PGDP groundwater plume maps are revised every two years to provide a basis for timely incorporation of routine groundwater monitoring and characterization data, demonstrate the progress of groundwater cleanup to date, and facilitate planning to optimize the site groundwater cleanup. These plume maps are intended to show the most recent sample result from each location as of the end of calendar year 2012. For wells that were not sampled in 2012, the most recent data from 2011 has been used. These plume maps are used, along with additional information, to further evaluate specific areas of groundwater contamination at PGDP in more detail for decision-making purposes based on individual project needs. More specific project evaluations are discussed in applicable documents, which are available through the EIC (www.paducaheic.com).

Northwest Plume Monitoring

The NWPGS is as an IRA by DOE for the Northwest Plume at PGDP to initiate hydraulic containment of the highest TCE concentration portion (greater than 1,000 µg/L) of the plume. Initial operation began in August 1995 with pumping from four wells in the core of the Northwest Plume (two wells each in a north and a south well field) for a combined withdrawal of approximately 220 gal/minute (the capacity of the treatment system) from the RGA. Each set of extraction wells is surrounded by MWs (Figure 6.7). Continued operation of the NWPGS has reduced contaminant levels in the off-site core of the Northwest Plume (downgradient of the extraction wells). Contaminant levels in the on-site core of the Northwest Plume (upgradient of the extraction wells) remain similar to those observed prior to NWPGS operation.

Beginning in August 2010, the NWPGS switched from withdrawal from the original four extraction wells to withdrawal from two new extraction wells located at the north boundary of the industrial area of PGDP (in the vicinity of the original south well field). The location of these extraction wells was optimized to capture the core and the lateral extent of the Northwest Plume in the area of the north plant boundary. The two new extraction wells operate at a pumping rate of approximately 110 gal/minute each (NOTE: Each of these extraction wells is capable of pumping up to 220 gal/minute). The number of MWs monitoring the Northwest Plume IRA increased from 12 to 33 wells during CY 2010 (Figure 6.7). The network is used for monitoring groundwater quality and water levels to determine the effectiveness of the interim action. Figure 6.7 shows the Northwest Plume, as reported in *Trichloroethene and Technetium-99 Groundwater Contamination in the Regional Gravel Aquifer for Calendar Year 2012 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (LATA Kentucky 2013d).

During CY 2012, TCE concentrations in MW340 remained about the same as the previous year at 13,000 µg/L, while nearby well MW339 has declined from 12,000 µg/L in CY 2010 to 580 µg/L, in response to the operation of the new extraction wells. During the same period, TCE concentrations declined from 700 µg/L in CY 2010 to 140 µg/L in CY 2012 in MW456 and increased from 24 µg/L in CY 2010 to 470 µg/L in CY 2012 in MW458 (both wells located on the west side of the Northwest Plume), as the core of the plume in the LRGA was pulled eastward, toward the extraction wells. TCE concentrations remained elevated (210 µg/L) in the LRGA in MW500 to the east of the new extraction wells, as a zone of contamination was pulled back toward the east extraction well. These results are consistent with expected shifts anticipated as a result of the optimization of the NWPGS. Groundwater modeling completed since the NWPGS operational changes in 2010 indicates that the capture of the core and lateral extent of the Northwest Plume in the area of the north plant boundary has increased. Especially noteworthy is that the 100 µg/L contour has been extended further to the north in the Northwest Plume for the 2012 plume map, in comparison to the 2010 plume map, based on higher concentrations being observed at MW454. Plume concentrations in MW454, located slightly north of the extraction well field, have increased above 100 µg/L since 2010. The reason for the increase in TCE concentrations in MW454 is uncertain due to limited sampling data collected since NWPGS optimization (see Chapter 3). A likely reason for the observed increased concentration is migration of higher plume concentrations upgradient or sidegradient to the area of MW454 due to groundwater extraction at the extraction wells installed in 2009.

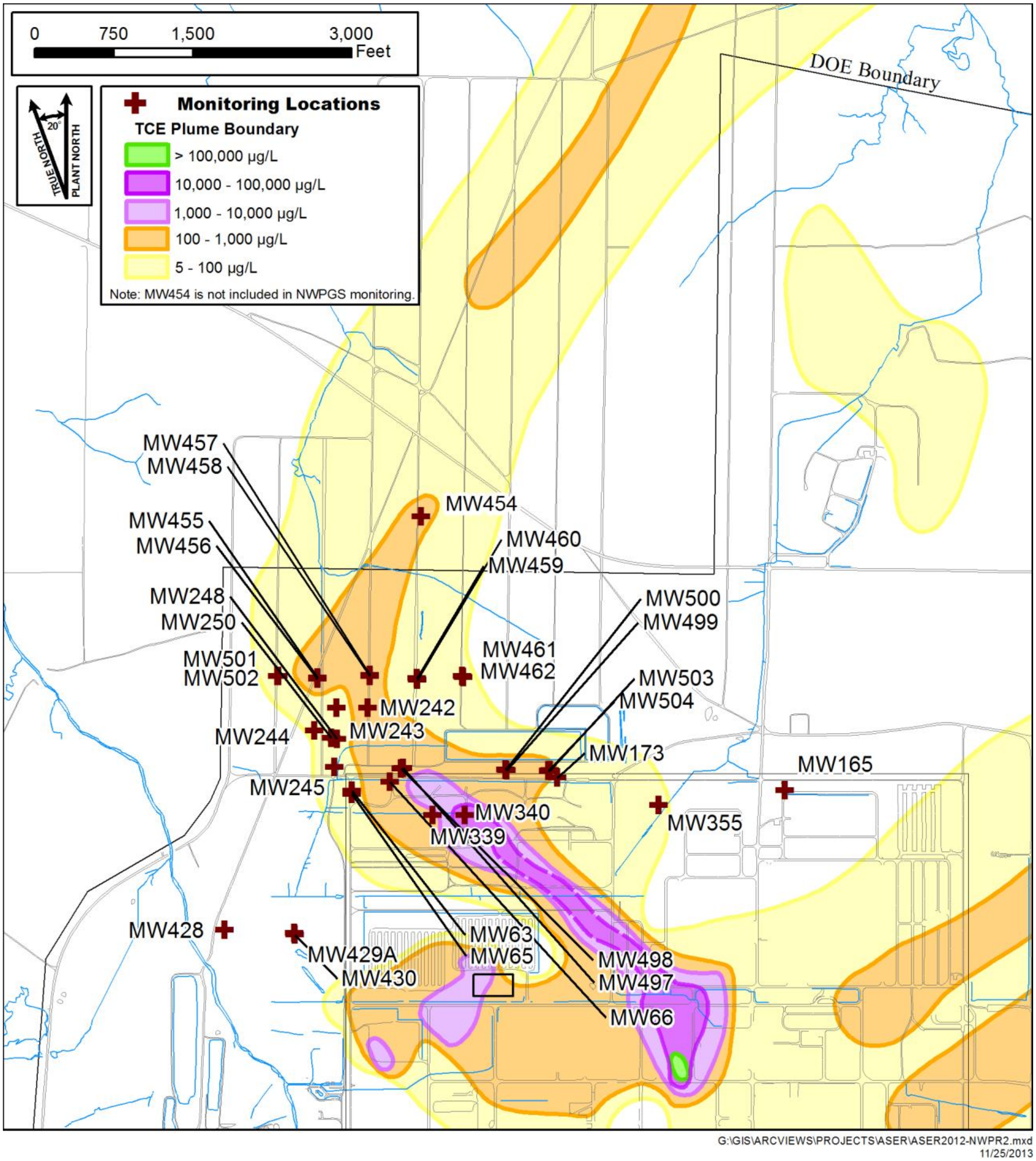

Figure 6.7. Northwest Plume MWs (2012 TCE Plume Shown)

While further monitoring data are needed to understand the shift in the 100 µg/L contour, it is anticipated that the higher TCE concentration seen in samples from MW454 will be lower in the future as the extraction system capture zone stabilizes.

Figure 6.8 shows the changes to the TCE groundwater plume from 2000 to 2012, as a result of ongoing remediation activities at PGDP. DOE continues to refine model predictions using analytical data collected from the PGDP monitoring well network. The changes demonstrated in Figure 6.8 provide information on the cleanup progress to date and provide modelers with better information to use for model prediction when evaluating decisions for future cleanup projects.

Summaries of the program's monitoring results are listed in Table 6.6. Measured physical parameters for these wells are listed below. The data for this program are reported in the FFA Semiannual Progress Report.

- Depths to water ranged from 38.92 ft to 55.09 ft
- pH ranged from 4.86 Std Units to 6.88 Std Units
- Redox ranged from 62 mV to 868 mV
- Temperature ranged from 51.7°F to 69.5°F

C-400 Interim Remedial Action and Surrounding Area

The C-400 IRA utilizes ERH to remediate TCE near the C-400 Building. A treatability study was performed previously (the Six-Phase ERH pilot project) to determine the effectiveness of ERH at the site (see Chapter 3 for additional information regarding the Six-Phase ERH pilot project). According to the Federal Facility Agreement Semiannual Progress Report for the Second Half of Fiscal Year 2012, the Six-Phase ERH pilot project removed an estimated 1,900 gal of TCE (DOE 2012h). Phase I of the C-400 IRA removed an additional 535 gal of TCE. Construction for C-400 Phase IIa began in 2012.

Monitoring for the C-400 IRA is conducted as part of environmental surveillance. In 2012, TCE in samples from MW408 PRT5 ranged from 390,000 to 1,400,000 µg/L. The high value of 1,400,000 µg/L in 2012 represents the historical maximum for TCE detected in RGA groundwater at PGDP. This maximum value is consistent with previous TCE concentrations from this area and is consistent with the presence of TCE DNAPL associated with the C-400 site. Previous historical maximum values for TCE in groundwater in the RGA at PGDP have been observed since monitoring was initiated at this location in 2003 with values periodically exceeding 1,000,000 µg/L.

As noted above, results from 2012 at this location show not only a historical maximum, but also show variability throughout the year. Variability in TCE values at this location, similar to those in 2012, has been observed over time. There are a variety of factors that may cause temporal variations in TCE concentrations in the RGA. These factors include variations in river stage, variations in recharge rate, the typically heterogeneous nature of the distribution of DNAPL in subsurface source areas, and the influence of nearby source-action remedies. Temporal fluctuations over time, similar to those observed in the C-400 area, are not unexpected at a source zone undergoing treatment in phases. Monitoring of the RGA in this area is ongoing with remediation.

Northeast Plume Monitoring

The EPA approved an interim ROD for treatment of the Northeast Plume in June of 1995. The treatment system was completed in 1996. Operation began in 1997 and included two extraction wells, several MWs (Figure 6.9), and facilities required to transfer the TCE-contaminated water to the USEC C-637 Cooling Tower for treatment. Groundwater quality and water-level information obtained from the MWs is used to evaluate the effectiveness of the remedial action. The upgradient MWs also are used to measure Tc-99 contamination within the plume before it reaches the extraction wells. Figure 6.9 depicts the Northeast Plume, as mapped in *Trichloroethene and Technetium-99 Groundwater Contamination in the Regional Gravel Aquifer for Calendar Year 2012 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (LATA Kentucky 2013d).

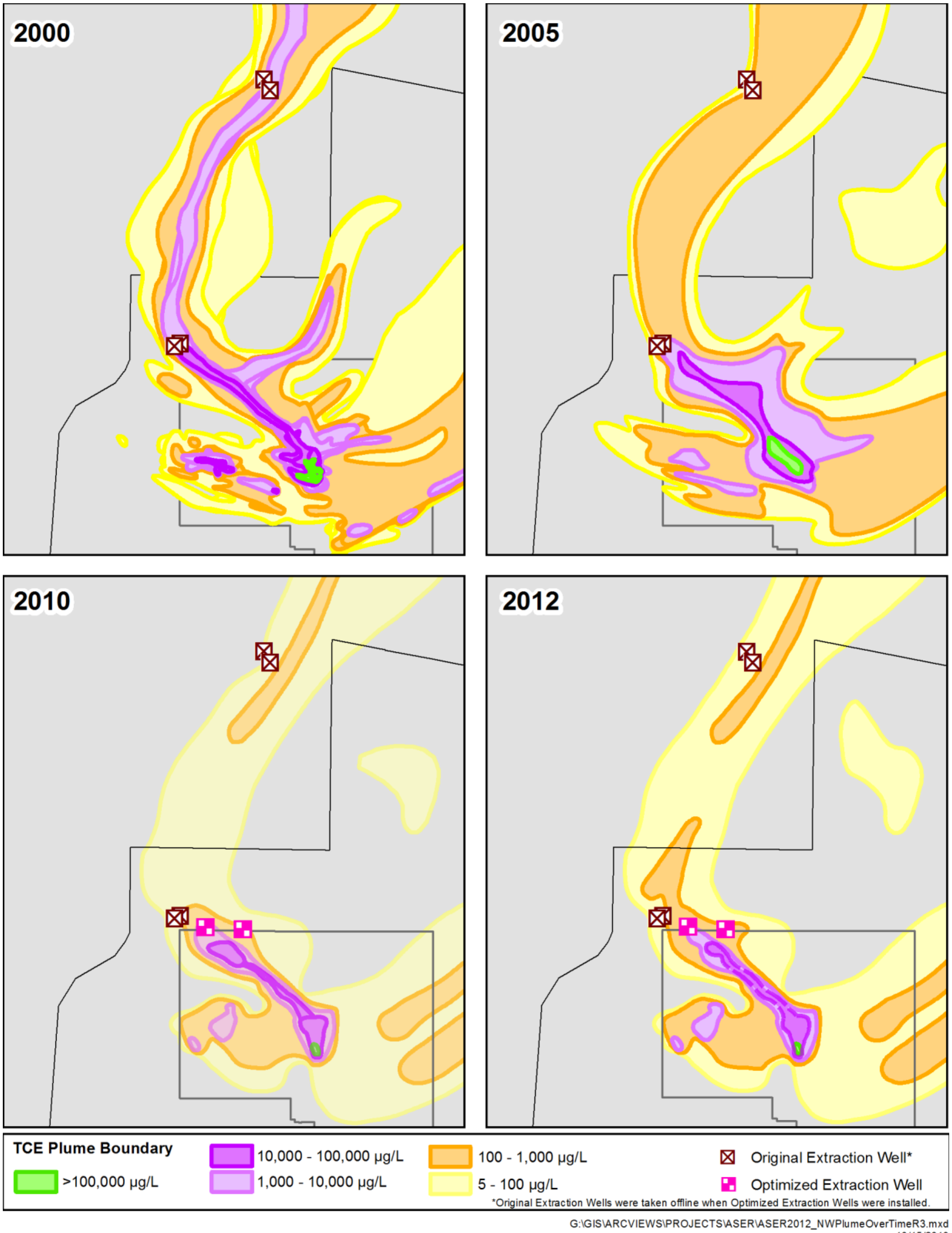

Figure 6.8. Northwest Plume Over Time as a Result of the Optimization

Table 6.6. Summary of Maximum Groundwater Results from the Northwest Plume Groundwater Monitoring for CY 2012

Parameter	MW 63	MW 65	MW 66	MW 173	MW 242	MW 243	MW 244	MW 245	MW 248	MW 250	MW 339	MW 340	MW 355	MW 428	MW 429A	MW 430	Reference Value[a]
ANIONS (mg/L)																	
Alkalinity	NR	NR	NR	NR	70	NR	NR	NR	NR	NR	84	NR	NR	NR	NR	NR	--
Chloride	NR	NR	NR	NR	58	NR	NR	NR	NR	NR	75	NR	NR	NR	NR	NR	--
Ferrous Iron	NR	NR	NR	NR	ND	NR	NR	NR	NR	NR	0.31	NR	NR	NR	NR	NR	--
Fluoride	NR	NR	NR	NR	0.11	NR	NR	NR	NR	NR	0.11	NR	NR	NR	NR	NR	4
Nitrate as Nitrogen	NR	NR	NR	NR	1.3	NR	NR	NR	NR	NR	1.9	NR	NR	NR	NR	NR	10
Sulfate	NR	NR	NR	NR	12	NR	NR	NR	NR	NR	17	NR	NR	NR	NR	NR	--
METALS (mg/L)																	
Arsenic	NR	NR	NR	NR	0.00178	NR	NR	NR	NR	NR	0.00145	NR	NR	NR	NR	NR	0.01
Barium	NR	NR	NR	NR	0.262	NR	NR	NR	NR	NR	0.139	NR	NR	NR	NR	NR	2
Calcium	NR	NR	NR	NR	26.6	NR	NR	NR	NR	NR	33.6	NR	NR	NR	NR	NR	--
Chromium	NR	NR	NR	NR	ND	NR	NR	NR	NR	NR	0.0536	NR	NR	NR	NR	NR	0.1
Iron	NR	NR	NR	NR	ND	NR	NR	NR	NR	NR	0.226	NR	NR	NR	NR	NR	--
Magnesium	NR	NR	NR	NR	11	NR	NR	NR	NR	NR	13.1	NR	NR	NR	NR	NR	--
Manganese	NR	NR	NR	NR	0.0262	NR	NR	NR	NR	NR	0.0213	NR	NR	NR	NR	NR	--
Molybdenum	NR	NR	NR	NR	ND	NR	NR	NR	NR	NR	0.00409	NR	NR	NR	NR	NR	--
Nickel	NR	NR	NR	NR	ND	NR	NR	NR	NR	NR	0.02	NR	NR	NR	NR	NR	--
Potassium	NR	NR	NR	NR	0.949	NR	NR	NR	NR	NR	1.47	NR	NR	NR	NR	NR	--
Selenium	NR	NR	NR	NR	ND	NR	NR	NR	NR	NR	0.00611	NR	NR	NR	NR	NR	0.05
Sodium	NR	NR	NR	NR	23.4	NR	NR	NR	NR	NR	32.3	NR	NR	NR	NR	NR	--
Zinc	NR	NR	NR	NR	ND	NR	NR	NR	NR	NR	0.0321	NR	NR	NR	NR	NR	--
PHYSICAL PARAMETERS																	
Dissolved Oxygen (mg/L)	5.8	3.63	5.49	1.3	4.84	6.14	5.45	1.64	5.12	5.54	2.52	3.42	3.37	2.74	3.37	2.08	--
RADS (pCi/L)																	
Alpha activity	6.04	5.78	8.51	5.44[b]	13	4.55[b]	1.21[b]	4.24[b]	1.06[b]	5.48	8.64	**38.8**	2.4[b]	0.952[b]	2.26[b]	4.31[b]	15
Beta activity	10.4	**50.9**	**330**	3.08[b]	**194**	27.5	10.3	6.17	16	9.26	**203**	**1,500**	21.9	7.34	8.59	10.9	50
Technetium-99	12.6[b]	54.2	355	4.43[b]	218	38.4	6.08[b]	14.6[b]	33.4	8.44[b]	211	**2,170**	23.1	3.99[b]	10.4[b]	11[b]	900
VOLATILE ORGANIC ANALYTES (µg/L)																	
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.9	ND	ND	ND	200
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	11	ND	ND	ND	--
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**18**	ND	ND	ND	7
cis-1,2-Dichloroethene	ND	ND	ND	ND	2.1	ND	ND	5.3	1	1.9	12	**110**	3.5	ND	ND	ND	70
Methane (mg/L)	NR	NR	NR	NR	ND	NR	NR	NR	NR	NR	0.0218	NR	NR	NR	NR	NR	--
Trichloroethene	**9.3**	**14**	**1,200**	ND	**160**	**53**	**9.5**	**130**	**28**	**21**	**680**	**13,000**	**11**	ND	1.6	2.1	5
WET CHEMISTRY																	
Conductivity (µmho/cm)	293	245	278	323	377	305	270	323	269	275	465	571	336	233	599	366	--
Dissolved Solids (mg/L)	NR	NR	NR	NR	211	NR	NR	NR	NR	NR	285	NR	NR	NR	NR	NR	--
Silica (mg/L)	NR	NR	NR	NR	16	NR	NR	NR	NR	NR	20	NR	NR	NR	NR	NR	--
Turbidity (NTU)	43.9	30.2	74.5	37.4	44.8	250	2	146	55	51	143	50.2	20	1.7	0.2	11.4	--

Table 6.6. Summary of Maximum Groundwater Results from the Northwest Plume Groundwater Monitoring for CY 2012 (Continued)

Parameter	MW 454[c]	MW 455	MW 456	MW 457	MW 458	MW 459	MW 460	MW 461	MW 462	MW 497	MW 498	MW 499	MW 500	MW 501	MW 502	MW 503	MW 504	Reference Value[a]
ANIONS (mg/L)																		
Alkalinity	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	--
Chloride	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	--
Ferrous Iron	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	--
Fluoride	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	4
Nitrate as Nitrogen	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	10
Sulfate	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	--
METALS (mg/L)																		
Arsenic	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.01
Barium	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	2
Calcium	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	--
Chromium	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.1
Iron	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	--
Magnesium	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	--
Manganese	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	--
Molybdenum	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	--
Nickel	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	--
Potassium	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	--
Selenium	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.05
Sodium	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	--
Zinc	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	--
PHYSICAL PARAMETERS																		
Dissolved Oxygen (mg/L)	3.74	4.68	5.07	1.99	5.28	3.44	3.75	3.92	2.73	5.84	5.15	4.08	4.41	2.12	5.99	2.23	1.64	--
RADS (pCi/L)																		
Alpha activity	5.03	2.4[b]	2.74[b]	14.5	7.64	2.31[b]	0.535[b]	3.87[b]	13.9	10.9	7.87	13.7	**15.3**	2.18[b]	1.45[b]	8.58[b]	14.8[b]	15
Beta activity	**71.4**	23.6	**58**	6.85	**136**	**109**	**197**	**57.2**	**289**	**114**	**104**	**290**	**250**	4.79[b]	9.62	**213**	10[b]	50
Technetium-99	74.2	20.2	113	13[b]	159	128	244	60.9	343	115	116	338	314	7.57[b]	18.4	217	0.00[b,d]	900
VOLATILE ORGANIC ANALYTES (µg/L)																		
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	200
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.5	3.1	ND	ND	ND	ND	--
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.6	**9**	ND	ND	ND	ND	7
cis-1,2-Dichloroethene	ND	ND	1.1	ND	2.5	ND	ND	ND	1.6	11	2.5	5	7.3	ND	ND	120	ND	70
Methane (mg/L)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	--
Trichloroethene	**190**	**55**	**140**	**27**	**470**	**34**	**51**	1.4	**33**	**650**	**220**	**170**	**210**	ND	**7.1**	**350**	2	5
WET CHEMISTRY																		
Conductivity (µmho/cm)	358	403	250	317	315	418	648	261	667	420	277	450	462	563	262	989	1,570	--
Dissolved Solids (mg/L)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	--
Silica (mg/L)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	--
Turbidity (NTU)	0.1	8.1	1.6	1.3	0.8	3.3	14.8	33.3	89.9	77.2	63.1	41.5	45.4	0.3	0.1	17	3.1	--

[a] Reference values are from EPA MCLs, with the exception of Tc-99. Tc-99 reference value is from EPA's interpretation of the 4 mrem/year MCL. Values shown are for reference only.
[b] Results for this location all are reported at activities less than the laboratory's minimum detectable activity and/or radiological uncertainty.
[c] MW454 is not included in the Northwest Plume Groundwater Monitoring Program. The well is sampled biennially as part of Environmental Surveillance and was not sampled in 2012. MW454 data from 2011 is presented here in support of the plume map comparison (page 6-18).
[d] Consistent with NRC guidance, 0.00 is presented for results reported less than zero.
Bold = Exceeds criteria. -- = No reference value for this parameter. Shading represents no value.

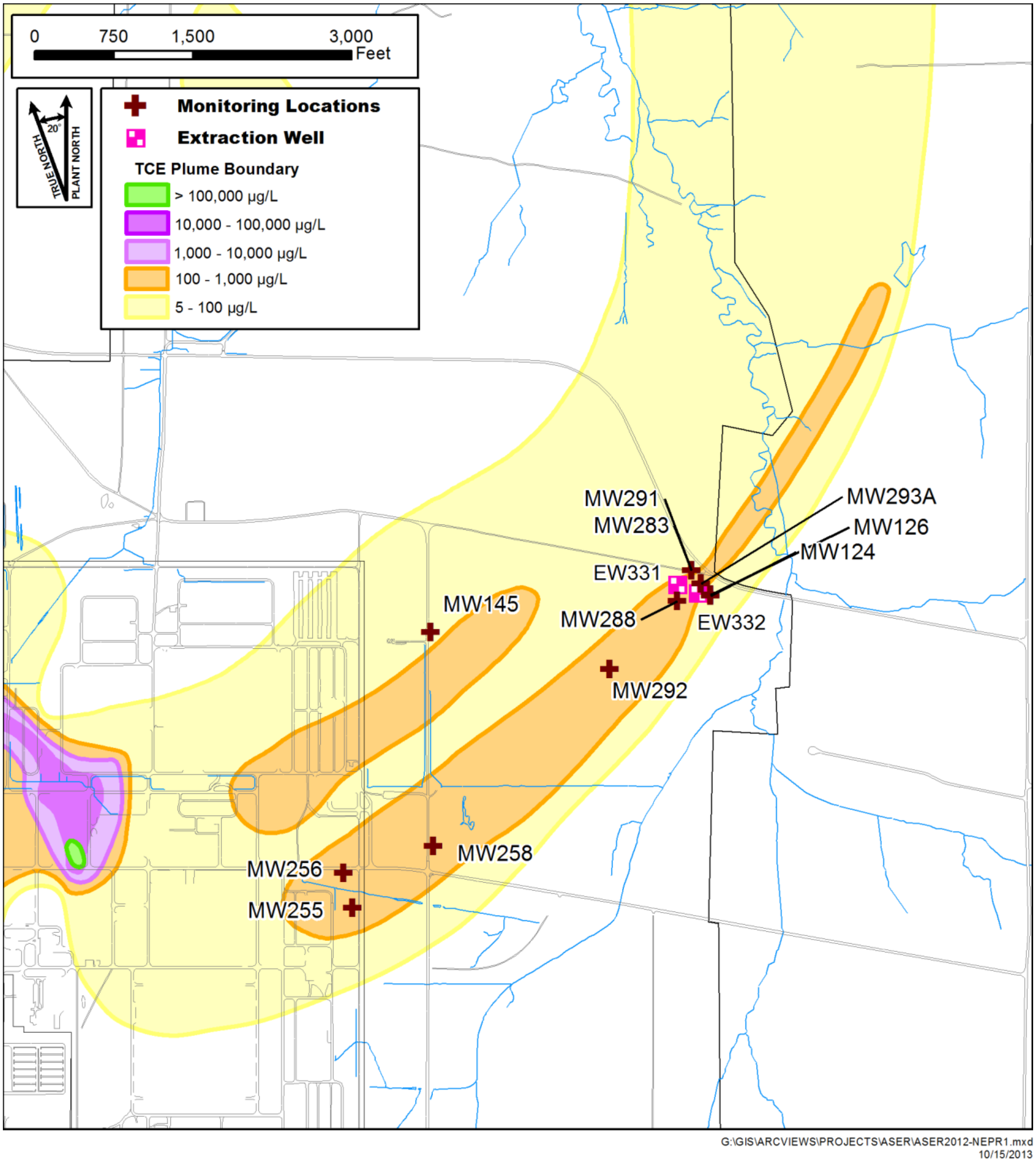

Figure 6.9. Northeast Plume MWs (2012 TCE Plume Shown)

There were no significant TCE concentration changes in the CY 2012 MW data. Comparison of monitoring results for upgradient and downgradient MWs indicates that the highest TCE concentration portion of the plume is being controlled. Likewise, Tc-99 concentrations in CY 2012 were similar to those measured in CY 2011. All Tc-99 concentrations were well below the 900 pCi/L reference value.

A summary of the program's monitoring results is listed in Table 6.7. The following are the measured physical parameters for these wells. The data for this program are reported in the FFA Semiannual Progress Report.

- Depths to water ranged from 39.95 ft to 63.54 ft
- pH ranged from 6.01 Std Units to 6.55 Std Units
- Redox ranged from -144 mV to 866 mV
- Temperature ranged from 55.3°F to 72.5°F

Southwest Plume Monitoring

Chapter 3 discusses the ROD for the Southwest Plume sources signed in March 2012. The western part of the Southwest Plume mapped for 2012 is similar to the extent mapped in previous years.

6.7 GROUNDWATER MONITORING RESULTS

Groundwater monitoring at the Paducah Site addresses general environmental surveillance, current and inactive landfills, groundwater plume pump-and-treat operations, the C-400 Cleaning Building, and area residential wells. The environmental surveillance monitoring program is reviewed each year and modified as appropriate to continue to delineate the boundaries of the contaminant plumes over time. Groundwater monitoring results from all sampling efforts conducted by the Paducah Site are compiled in the Paducah Oak Ridge Environmental Information System (OREIS) database. A complete listing of analytical results is available upon request or by visiting the PEGASIS Web site at http://padgis.latakentucky.com/padgis/ to view data.

Table 6.7. Summary of Maximum Groundwater Results from the Northeast Plume Groundwater Monitoring for CY 2012

Parameter	MW 124	MW 126	MW 145	MW 255	MW 256	MW 258	MW 283	MW 288	MW 291	MW 292	MW 293A	Reference Value[a]
ANIONS (mg/L)												
Alkalinity	NR	NR	120	NR	150	140	NR	110	NR	120	NR	--
Chloride	NR	NR	80	NR	46	41	NR	66	NR	55	NR	--
Fluoride	NR	NR	0.18	NR	0.21	0.23	NR	0.16	NR	0.18	NR	4
Nitrate as Nitrogen	NR	NR	ND	NR	ND	ND	NR	1.1	NR	1.2	NR	10
Sulfate	NR	NR	94	NR	27	32	NR	21	NR	23	NR	--
METALS (mg/L)												
Aluminum	NR	NR	0.35	NR	ND	ND	NR	ND	NR	ND	NR	--
Arsenic	NR	NR	ND	NR	ND	ND	NR	0.00111	NR	ND	NR	0.01
Barium	NR	NR	0.0567	NR	0.163	0.152	NR	0.258	NR	0.219	NR	2
Calcium	NR	NR	44.6	NR	26.9	22.9	NR	29.9	NR	26.2	NR	--
Chromium	NR	NR	**0.188**	NR	ND	0.0175	NR	0.0788	NR	ND	NR	0.1
Cobalt	NR	NR	0.00124	NR	ND	ND	NR	ND	NR	ND	NR	--
Iron	NR	NR	0.93	NR	ND	0.178	NR	0.565	NR	ND	NR	--
Lead	NR	NR	0.00158	NR	ND	ND	NR	ND	NR	ND	NR	0.05
Magnesium	NR	NR	18.1	NR	10.4	9.02	NR	12.4	NR	10.8	NR	--
Manganese	NR	NR	0.0161	NR	ND	ND	NR	ND	NR	ND	NR	--
Molybdenum	NR	NR	0.00228	NR	ND	ND	NR	0.00469	NR	ND	NR	--
Nickel	NR	NR	0.0349	NR	ND	ND	NR	ND	NR	ND	NR	--
Potassium	NR	NR	5.16	NR	1.78	1.8	NR	1.81	NR	1.76	NR	--
Selenium	NR	NR	ND	NR	ND	0.00631	NR	0.0064	NR	0.00713	NR	0.05
Sodium	NR	NR	67.1	NR	61.1	65.5	NR	45.3	NR	53	NR	--
PHYSICAL PARAMETERS												
Dissolved Oxygen (mg/L)	3.47	3.52	2.98	1.17	4.4	1.69	3.74	4.01	6.22	2.89	4.35	--
RADS (pCi/L)												
Alpha activity	4.75[b]	6.32	4.36[b]	2.3[b]	3[b]	4.2[b]	0.861[b]	1.11[b]	2.77[b]	1.44[b]	3.56[b]	15
Beta activity	8.02	7.58	38	11	**60.9**	9.73	8.83	38.8	7.87	40.9	5.77	50
Technetium-99	6.07[b]	14.2[b]	36.3	5.97[b]	75.2	12.2[b]	19	48	2.47[b]	78.2	4.03[b]	900
VOLATILE ORGANIC ANALYTES (µg/L)												
1,1-Dichloroethane	ND	ND	ND	ND	12	ND	ND	ND	ND	5.1	ND	--
1,1-Dichloroethene	ND	ND	ND	ND	99	ND	ND	17	ND	**37**	ND	7
cis-1,2-Dichloroethene	ND	ND	2.4	9	5	4.7	3.4	6.4	2.1	3.1	ND	70
Trichloroethene	**12**	ND	**51**	**320**	**250**	**220**	**65**	**210**	**59**	**280**	**230**	5
WET CHEMISTRY												
Conductivity (µmho/cm)	441	413	727	654	532	494	468	500	372	500	360	--
Dissolved Solids (mg/L)	NR	NR	426	NR	296	288	NR	269	NR	268	NR	--
Silica (mg/L)	NR	NR	20	NR	18	18	NR	16	NR	16	NR	--
Total Organic Carbon (mg/L)	NR	NR	1.2	NR	ND	ND	NR	ND	NR	ND	NR	--
Turbidity (NTU)	10	5.3	38.3	65.6	58.7	50.8	5.7	61.4	31	51.7	5.3	--

[a] Reference values are from EPA MCLs with the exception of lead and Tc-99. The reference value for lead is from 401 *KAR* 47:030. Tc-99 reference value is from EPA's interpretation of the 4 mrem/year MCL. Values shown are for reference only.

[b] Results for this location all are reported at activities less than the laboratory's minimum detectable activity and/or radiological uncertainty.

Bold = Exceeds criteria.

-- = No reference value for this parameter.

Shading represents no value.

7. QUALITY ASSURANCE

The Paducah Site maintains a Quality Assurance (QA)/Quality Control (QC) Program to verify the integrity of data generated within the Environmental Monitoring Program. Sampling methods, instruments, locations, schedules, and other sampling and monitoring criteria are based on applicable guidelines from various established authorities.

7.1 INTRODUCTION

The Paducah Site maintains a QA/QC Program to verify the integrity of data generated within the Environmental Monitoring Program. Each aspect of the monitoring program, from sample collection to data reporting, must comply with quality requirements and assessment standards. Requirements and guidelines for the QA/QC Program at the Paducah Site are established by the following:

- DOE Order 414.1C,[11] *Quality Assurance*;
- Quality Assurance Program and Implementation Plan, PAD-PLA-QM-001/R2 (LATA Kentucky 2010b);
- Commonwealth of Kentucky and federal regulations and guidance from EPA;
- American National Standards Institute;
- American Society of Mechanical Engineers;
- American Society for Testing and Materials (ASTM); and
- American Society for Quality Control.

The QA/QC Program specifies organizational and programmatic elements to control equipment, design, documents, data, nonconformances, and records. Emphasis is placed on planning, implementing, and assessing activities and implementing effective corrective actions, as necessary. Program requirements are specified in project and subcontract documents to ensure that requirements are included in project-specific QA plans and other planning documents. PGDP uses DOE Consolidated Audit Program (DOECAP)-audited laboratories. DOECAP implements annual performance qualification audits of environmental analytical laboratories and commercial waste treatment, storage, and disposal facilities to support complex-wide DOE mission activities.

In 2012, two separate EMPs defined the relationship of each element of the Environmental Monitoring Program. The FY 2012 EMP (LATA Kentucky 2011) was in effect and covered data collected during the time frame of January through September 2012. The FY 2013 EMP (LATA Kentucky 2012a) was in effect and covered data collected during the time frame of October 2012 through December 2012.

[11] DOE Order 414.1D replaced Order 414.1C on April 25, 2011, and will be implemented in 2013 under LATA Kentucky contract DE-AC30-10CC40020.

In 2012, the *Environmental Monitoring Quality Assurance Project Plan* (QA Plan) defined the relationship of each element of the Environmental Monitoring Program to key quality and data management requirements. The QA Plan is an appendix to the EMP (LATA Kentucky 2011; LATA Kentucky 2012a). A programmatic QA Plan was developed in 2012, and it will be implemented in 2013. Additionally, the following procedures further ensure quality:

- Field forms are maintained in accordance with PAD-RM-1009, *Records Management, Administrative Record, and Document Control.*
- Communication and documentation between the sample and data management organization and field sampling personnel are conducted in accordance with PAD-ENM-5007, *Data Management Coordination.*
- Sample labels and chains of custody are completed according to PAD-ENM-2708, *Chain-of-Custody Forms, Field Sample Logs, Sample Labels, and Custody Seals*.
- Data assessment is conducted by a technical reviewer or their designee according to PAD-ENM-5003, *Quality Assured Data*.
- Logbooks and data forms are prepared in accordance with PAD-ENM-2700, *Logbooks and Data Forms*.

The QA Plan and the procedures cited above were in effect and covered data collected during the time frame of January through December 2011. Training requirements, sample custody, procedures, instrument calibration and maintenance, and data review are a few of the subjects discussed in the QA Plan and above procedures.

7.2 FIELD SAMPLING QUALITY CONTROL

Data Quality Objectives and Sample Planning

From the start of any sampling program, data quality objectives (DQOs) play an important role in setting the number of samples, location of sampling sites, sampling methods, sampling schedules, and coordination of sampling and analytical resources to meet critical completion times. These sampling program criteria are documented in the Paducah Site EMP (LATA Kentucky 2011; LATA Kentucky 2012a).

Each sampling location and sample collected is assigned a unique identification number. Each segment of the identification number sequence is used to designate information concerning the location from which a sample is collected. To progress from planning to implementing the DQOs, an analytical statement of work (SOW) for the analytical laboratory was generated from a system within the Paducah Integrated Data System. From this system, the Project Environmental Measurements System (PEMS), an electronic database used for managing and streamlining field-generated and laboratory-generated data, is populated with sample identification numbers, sampling locations, sampling methods, analytical parameters, analytical methods, and sample container and preservative requirements. This information is used to produce sample bottle labels and chain-of-custody forms for each sampling event.

Field Measurements

Field measurements for the groundwater and surface water monitoring program are collected in the field and include water level measurements, pH, conductivity, flow rate, turbidity, temperature, dissolved oxygen, total residual chlorine, ORP (oxidation/reduction potential) and barometric pressure. Environmental conditions, such as ambient temperature and weather, also are recorded. Field measurements are collected, downloaded electronically, recorded on appropriate field forms or recorded in logbooks, and input into PEMS.

Sampling Procedures

Samples are collected using media-specific procedures, which are written according to EPA-approved sampling methods. Sample media consist of surface water, groundwater, sediment, and biota. Sample information recorded during a sampling event consists of the sample identification number, station (or location), date collected, time collected, and person who performed the sampling. This information, which is documented in a logbook, on a chain-of-custody form, and on the sample container label, then is input directly into PEMS. Chain-of-custody forms are maintained from the point of sampling, and the samples are protected properly until they are placed in the custody of an analytical laboratory.

Field Quality Control Samples

The QC program for both groundwater and environmental monitoring activities specifies a minimum target rate of 5%, or 1 per 20 environmental samples, for field QC samples. Table 7.1 shows the types of field QC samples collected and analyzed. Analytical results of field QC samples are evaluated to determine if the sampling event biased the sample results.

Table 7.1. Types of QC Samples

Field QC Samples	Laboratory QC Samples
Field blanks[a]	Laboratory duplicates
Field duplicates	Reagent blanks
Trip blanks[a]	Matrix spikes[b]
Equipment rinseates[c]	Matrix spike duplicates
	Performance evaluations
	Laboratory control samples

[a] Blanks = Samples of deionized water used to assess potential contamination from a source other than the media being sampled.
[b] Spikes = Samples that have been mixed with a known quantity of a chemical to measure overall method effectiveness during the analysis process, as well as possible sample/matrix interferences.
[c] Rinseates = Samples of deionized water that have been used to rinse the sampling equipment. It is collected after completion of decontamination and prior to sampling. It is used to assess adequate decontamination of sampling equipment.

7.3 ANALYTICAL LABORATORY QUALITY CONTROL

Analytical Procedures

When available and appropriate for the sample matrix, EPA-approved SW-846 methods are used for sample analysis. When SW-846 methods are not available, other nationally recognized methods, such as those developed by DOE and ASTM, are used. Analytical methods are identified in a SOW for laboratory services. Using guidance from EPA, laboratories document the steps in sample handling, analysis, reporting results, and follow chain-of-custody procedures.

Laboratory Quality Control Samples

Laboratory QC samples are prepared and analyzed as required by the analytical methods used. Typical laboratory QC samples are identified in Table 7.1. If QC acceptance criteria are not met, then appropriate action, as denoted by the analytical method, is taken or the analytical data are qualified appropriately.

Independent Quality Control

The Paducah Site is required by DOE and EPA to participate in independent QC programs. The site also participates in voluntary independent programs to improve analytical QC. These programs generate data that readily are recognized as objective measures that provide participating laboratories and government agencies a periodic review of their performance. Results that exceed acceptable limits are investigated and documented according to formal procedures. Although participation in certain programs is mandatory, the degree of participation is voluntary, so that each laboratory can select parameters of particular interest to that facility. These programs are conducted by EPA, DOE, and commercial laboratories.

The EPA and KDOW require, as part of their QA program, a laboratory QA study. Each laboratory performing analyses to demonstrate KPDES permit compliance is required to participate. Three laboratories and one sampling organization participated in the study in 2011. Final results for the Discharge Monitoring Report QA Study Number 31 were "acceptable," with the exception of iron. A corrective action report was submitted in September 2011. Discharge Monitoring Report QA Study results were provided to KDOW and EPA, as required.

Laboratory Audits/Sample and Data Management Organization

Laboratory audits are performed annually by the DOECAP to ensure that the laboratories are in compliance with regulations, methods, and procedures. The audited laboratories are included on the DOECAP-audited listing for use by the sample and data management organization. Findings are documented and addressed by the audited laboratory through corrective actions. LATA Kentucky reviews DOECAP audit reports and laboratory corrective action plans for compliance with LATA Kentucky requirements on an annual basis.

7.4 DATA MANAGEMENT

Project Environmental Measurements System

The data generated from sampling events are stored in PEMS, a consolidated site data system for tracking and managing data. The system is used to manage field-generated data, import laboratory-generated data, input data qualifiers identified during the data review process, and transfer data to the Paducah OREIS database for reporting. PEMS uses a variety of references and code lists to ensure consistency and standardization of the data.

Paducah OREIS

Paducah OREIS is the database used to consolidate data generated by the Environmental Monitoring Program. Data consolidation consists of the activities necessary to prepare the evaluated data for the users. The PEMS files containing the assessed data are transferred from PEMS to Paducah OREIS for future use. The data manager is responsible for notifying the project team and other data users of the available data. Data used in reports distributed to external agencies (e.g., the quarterly landfill reports and the ASER) that are obtained from Paducah OREIS and have been through the data review process. [The data review process is documented in *Data and Documents Management and Quality Assurance Plan for Paducah Environmental Management and Enrichment Facilities*, Section 8.4 (DOE 1998)].

PEGASIS

PEGASIS allows access to environmental sampling data and site-specific GIS features through the Internet. PEGASIS includes analytical sample results from various environmental studies, restoration reports and supporting documents, and maps. Environmental data loaded to Paducah OREIS has been assessed, verified, and validated (if applicable) , as specified in PAD-ENM-5003, *Quality Assured Data*. Environmental data from Paducah OREIS is loaded into PEGASIS on a quarterly basis. PEGASIS does not contain data related to waste or facility characterization. Access to PEGASIS is available at http://padgis.latakentucky.com/padgis/.

Electronic Data Deliverables

A "results only" electronic data deliverable (EDD) is requested for all samples analyzed by each laboratory. The results and qualifier information from the EDD are checked in addition to the format of all fields provided. Discrepancies are reported immediately to the laboratory so corrections can be made or new EDDs can be issued. Approximately 10% of the EDDs are randomly checked to verify that the laboratory continues to provide adequate EDDs.

Data Packages

A "forms only" Level III data package is requested from the laboratory when data validation is to be performed on a specific sampling event or media. All data packages received from the fixed-base laboratory are tracked, reviewed, and maintained in a secure environment. The following information is tracked: sample delivery group number, date received, receipt of any EDD, and comments. The contents of the data package and the chain-of-custody forms are compared and discrepancies identified. Discrepancies are reported immediately to the laboratory and data validators. All data packages are forwarded to the Document Management Center for permanent storage.

Laboratory Contractual Screening

Laboratory contractual screening is the process of evaluating a set of data against the requirements specified in the analytical SOW to ensure that all requested information is received. The contractual screening includes, but is not limited to, the chain-of-custody form, analytes requested, method used, units, holding times, and reporting limits achieved. The contractual screening is conducted electronically upon receipt of data from the analytical laboratory. Any exception to the SOW is identified and documented.

Data Verification, Validation, and Assessment

Data verification is the process for comparing a data set against a set standard or contractual requirement. Verification is performed electronically, manually, or by a combination of both. Data verification includes contractual screening and other criteria specific to the data. Data are flagged as necessary. Verification qualifiers are stored in PEMS and transferred with the data to Paducah OREIS.

Data validation is the process performed by a qualified individual for a data set, independent from sampling, laboratory, project management, or other decision making personnel. Data validation evaluates laboratory adherence to analytical method requirements. Validation qualifiers are stored in PEMS and transferred with the data to Paducah OREIS. Data from routine sampling events are validated programmatically at a frequency of 5% of the total data packages. Each of the selected data packages, which make up 5% of the total number of data packages, is validated 100%.

Data assessment is the process for assuring that the type, quality, and quantity of data are appropriate for their intended use based on the DQOs. It allows for the determination that a decision (or estimate) can be made with the desired level of confidence, given the quality of the data set. Data assessment follows data verification and data validation (if applicable) and must be performed at a rate of 100% to ensure data are useable. The data assessment is conducted by trained technical personnel in conjunction with other project team members. Assessment qualifiers are stored in PEMS and transferred with the data to Paducah OREIS. Data are made available for reporting from Paducah OREIS upon completion of the data assessment, and associated documentation is filed with the project files. Rejected data identified in the verification or validation process are noted as rejected in OREIS.

The EPA and KDOW require, as part of their QA program, a laboratory QA study. Each laboratory performing analyses to demonstrate KPDES permit compliance is required to participate. Three laboratories and one sampling organization participated in the study in 2011.

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Glossary

absorption—The process by which the number and energy of particles or photons entering a body of matter are reduced by interaction with the matter.

adsorption—The accumulation of gases, liquids, or solutes on the surface of a solid or liquid.

activity—See radioactivity.

air stripping—The process of bubbling air through water to remove volatile organic compounds from the water.

alpha particle—A positively charged particle emitted from the nucleus of an atom having the same charge and mass as that of a helium nucleus (two protons and two neutrons).

ambient air—The atmosphere around people, plants, and structures.

analyte—A constituent or parameter being analyzed.

aquifer—A geologic formation, group of formations, or part of a formation capable of yielding a significant amount of groundwater to wells or springs.

aquitard—A geologic unit that inhibits the flow of water.

assimilate—To take up or absorb.

atom—Smallest particle of an element capable of entering into a chemical reaction.

beta particle—A negatively charged particle emitted from the nucleus of an atom. It has a mass and charge equal to those of an electron.

biota—The animal and plant life of a particular region considered as a total ecological entity.

CERCLA-reportable release—A release to the environment that exceeds reportable quantities as defined by the Comprehensive Environmental Response, Compensation, and Liability Act.

chain-of-custody form—A form that documents sample collection, transport, analysis, and disposal.

closure—Formal shutdown of a hazardous waste management facility under Resource Conservation and Recovery Act requirements.

compliance—Fulfillment of applicable requirements of a plan or schedule ordered or approved by government authority.

composite sample—A single sample that is representative of a continuous event or multiple increments over a designated period of time at a particular location.

concentration—The amount of a substance contained in a unit volume or mass of a sample.

conductivity—A measure of a material's capacity to convey an electric current. For water, this property is related to the total concentration of the ionized substances in water and the temperature at which the measurement is made.

confluence—The point at which two or more streams meet; the point where a tributary joins the main stream.

congener—Any particular member of a class of chemical substances. A specific congener is denoted by a unique chemical structure.

contained landfill—A solid waste site or facility that accepts disposal of solid waste. The technical requirements for contained landfills are found in 401 *KAR* 47:080, 48:050, and 48:070 to 48:090.

contamination—Deposition of radioactive material on the surfaces of structures, areas, objects, or personnel; or introduction of microorganisms, chemicals, toxic substances, wastes, or wastewater into water, air, and soil in a concentration greater than that found naturally.

cosmic radiation—Ionizing radiation with very high energies that originates outside the earth's atmosphere. Cosmic radiation is one contributor to natural background radiation.

curie (Ci)—A unit of radioactivity. One curie is defined as 3.7×10^{10} (37 billion) disintegrations per second. Several fractions and multiples of the curie are used commonly:

- **kilocurie (kCi)**—10^3 Ci, one thousand curies; 3.7×10^{13} disintegrations per second.
- **millicurie (mCi)—**10^{-3} Ci, one-thousandth of a curie; 3.7×10^7 disintegrations per second.
- **microcurie (µCi)—**10^{-6} Ci, one-millionth of a curie; 3.7×10^4 disintegrations per second.
- **picocurie (pCi)**—10^{-12} Ci, one-trillionth of a curie; 3.7×10^{-2} disintegrations per second.

daughter—A nuclide formed by the radioactive decay of a parent nuclide.

decay, radioactive—The spontaneous transformation of one radionuclide into a different radioactive or nonradioactive nuclide or into a different energy state of the same radionuclide.

dense nonaqueous-phase liquid (DNAPL)—The liquid phase of chlorinated organic solvents. These liquids are denser than water and include commonly used industrial compounds such as tetrachloroethene and trichloroethene.

derived concentration guide (DCG)—The concentration of a radionuclide in air or water that, under conditions of continuous exposure for one year by one exposure mode (i.e., ingestion of water, submersion in air, or inhalation), would result in either an effective dose equivalent of 0.1 rem (1 mSv) or a dose equivalent of 5 rem (50 mSv) to any tissue, including skin and the lens of the eye. The guidelines for radionuclides in air and water are given in DOE Order 5400.5, *Radiation Protection of the Public and the Environment.*

derived concentration technical standard (DCS)—A DOE technical standard that documents the derived concentration value for a radionuclide in water that would result in a dose of 100 mrem in a year to a gender- and age-weighted reference person using DOE-approved dose conversion factors and assuming continuous exposure. The standard is established in DOE Order 458.1, *Radiation Protection of the Public and the Environment.*

disintegration, nuclear—A spontaneous nuclear transformation (radioactivity) characterized by the emission of energy and/or mass from the nucleus of an atom.

dose—The energy imparted to matter by ionizing radiation. The unit of absorbed dose is the rad, equal to 0.01 joules per kilogram in any medium.

- **absorbed dose**—The quantity of radiation energy absorbed by an organ divided by the organ's mass. Absorbed dose is expressed in units of rad (or gray) (1 rad = 0.01 Gy).

- **dose equivalent—**The product of the absorbed dose (rad) in tissue and a quality factor. Dose equivalent is expressed in units of rem (or sievert) (1 rem = 0.01 Sv).

- **committed dose equivalent**—The calculated total dose equivalent to a tissue or organ over a 50-year period after known intake of a radionuclide into the body. Contributions from external dose are not included. Committed dose equivalent is expressed in units of rem (or sievert).

- **committed effective dose equivalent/committed effective dose—**The sum of total absorbed dose (measured in mrem) to a tissue or organ received over a 50-year period resulting from the intake of radionuclides, multiplied by the appropriate weighting factor. The committed effective dose equivalent is the product of the annual intake (pCi) and the dose conversion factor for each radionuclide (mrem/pCi). Committed effective dose equivalent is expressed in units of rem (or sievert).

- **effective dose equivalent/effective dose**—The sum of the dose equivalents received by all organs or tissues of the body after each one has been multiplied by an appropriate weighting factor. The effective dose equivalent includes the committed effective dose equivalent from internal deposition of radionuclides and the effective dose equivalent attributable to sources external to the body.

- **collective effective dose equivalent/collective dose equivalent**—The sums of the dose equivalents or effective dose equivalents of all individuals in an exposed population within a 50-mile radius expressed in units of person-rem (or person-sievert). When the collective dose equivalent of interest is for a specific organ, the units would be organ-rem (or organ-sievert). The 50-mile distance is measured from a point located centrally with respect to major facilities or DOE program activities.

downgradient—In the direction of decreasing hydrostatic head.

downgradient well—A well that is installed hydraulically downgradient of a site and that may be capable of detecting migration of contaminants from a site.

drinking water standards (DWS)—Federal primary drinking water standards, both proposed and final, as set forth by the EPA in 40 *CFR* § 141 and 40 *CFR* § 143.

effluent—A liquid or gaseous waste discharge to the environment.

effluent monitoring—The collection and analysis of samples or measurements of liquid and gaseous effluents for purposes of characterizing and quantifying the release of contaminants, assessing radiation exposures to members of the public, and demonstrating compliance with applicable standards.

Environmental Restoration—A DOE program that directs the assessment and cleanup of its sites (remediation) and facilities (decontamination and decommissioning) contaminated with waste as a result of nuclear-related activities.

exposure (radiation)—The incidence of radiation on living or inanimate material by accident or intent. Background exposure is the exposure to natural background ionizing radiation. Occupational exposure is that exposure to ionizing radiation received at a person's workplace. Population exposure is the exposure to the total number of persons who inhabit an area.

external radiation—Exposure to ionizing radiation when the radiation source is located outside the body.

formation—A mappable unit of consolidated or unconsolidated geologic material of a characteristic lithology or assemblage of lithologies.

gamma ray—High-energy, short-wavelength electromagnetic radiation emitted from the nucleus of an excited atom. Gamma rays are identical to X-rays except for the source of the emission.

grab sample—An individual sample collected within a short period of time at a particular location.

groundwater, unconfined—Water that is in direct contact with the atmosphere through open spaces in permeable material.

half-life, radiological—The time required for half of a given number of atoms of a specific radionuclide to decay. Each nuclide has a unique half-life.

hardness—The amount of calcium carbonate dissolved in water, usually expressed as part of calcium carbonate per million parts of water.

high-level waste—High-level radioactive waste or HLW means: (1) irradiated reactor fuel; (2) liquid wastes resulting from the operation of the first cycle solvent extraction system, or equivalent, and the concentrated wastes from subsequent extraction cycles, or equivalent, in a facility for reprocessing irradiated reactor fuel; and (3) solids into which such liquid wastes have been converted.

hydrogeology—Hydraulic aspects of site geology.

hydrology—The science dealing with the properties, distribution, and circulation of natural water systems.

in situ—In its original place; field measurements taken without removing the sample from its origin; remediation performed while groundwater remains below the surface.

internal dose factor—A factor used to convert intakes of radionuclides to dose equivalents.

internal radiation—Occurs when natural radionuclides enter the body by ingestion of foods or liquids or by inhalation. Radon is the major contributor to the annual dose equivalent for internal radionuclides.

ion—An atom or compound that carries an electrical charge.

irradiation—Exposure to radiation.

isotopes—Forms of an element having the same number of protons but differing numbers of neutrons in the nuclei.

- **long-lived isotope**—A radionuclide that decays at such a slow rate that a quantity of it will exist for an extended period (half-life is greater than three years).

- **short-lived isotope**—A radionuclide that decays so rapidly that a given quantity is transformed almost completely into decay products within a short period (half-life is two days or less).

laboratory detection limit—The lowest reasonably accurate concentration of an analyte that can be detected; this value varies depending on the method, instrument, and dilution used.

lower limit of detection—The smallest concentration or amount of analyte that can be reliably detected in a sample at a 95% confidence level.

maximally exposed individual—A hypothetical individual who remains in an uncontrolled area and would, when all potential routes of exposure from a facility's operations are considered, receive the greatest possible dose equivalent.

migration—The transfer or movement of a material through air, soil, or groundwater.

milliroentgen (mR)—A measure of X-ray or gamma radiation. The unit is one-thousandth of a roentgen.

minimum detectable concentration—The smallest amount or concentration of a radionuclide that can be distinguished in a sample by a given measurement system at a preselected counting time and at a given confidence level.

monitoring—Process whereby the quantity and quality of factors that can affect the environment or human health are measured periodically to regulate and control potential impacts.

mrem—The dose equivalent that is one-thousandth of a rem.

natural radiation—Radiation from cosmic and other naturally occurring radionuclide (such as radon) sources in the environment.

nuclide—An atom specified by its atomic weight, atomic number, and energy state. A radionuclide is a radioactive nuclide.

outfall—The point of conveyance (e.g., drain or pipe) of wastewater or other effluents into a ditch, pond, or river.

part per billion (ppb)—A unit measure of concentration equivalent to the weight/volume ratio expressed as µg/L or mg/mL.

part per million (ppm)—A unit measure of concentration equivalent to the weight/volume ratio expressed as mg/L.

pathogen—A disease-producing agent; usually refers to living organisms.

person-rem—Collective dose to a population group. For example, a dose of 1 rem to 10 individuals results in a collective dose of 10 person-rem.

pH—A measure of the hydrogen-ion concentration in an aqueous solution. Acidic solutions have a pH from 0 to 7, neutral solutions have a pH equal to 7, and basic solutions have a pH greater than 7.

piezometer—An instrument used to measure the hydraulic potential of groundwater at a given point; also, a well designed for this purpose.

polychlorinated biphenyl (PCB)—Any chemical substance that is limited to the biphenyl molecule and that has been chlorinated to varying degrees.

polycyclic aromatic hydrocarbon (PAH)—Any organic compound composed of more than one benzene ring.

process water—Water used within a system process.

purge—To remove water before sampling, generally by pumping or bailing.

quality assurance (QA)—Any action in environmental monitoring to ensure the reliability of monitoring and measurement data.

quality control (QC)—The routine application of procedures within environmental monitoring to obtain the required standards of performance in monitoring and measurement processes.

quality factor—The factor by which the absorbed dose (rad) is multiplied to obtain a quantity that expresses, on a common scale for all ionizing radiation, the biological damage to exposed persons. A quality factor is used because some types of radiation, such as alpha particles, are more biologically damaging than others.

rad—An acronym for radiation absorbed dose. The rad is a basic unit of absorbed radiation dose. (This is being replaced by the "gray," which is equivalent to 100 rad.)

radiation detection instruments—Devices that detect and record the characteristics of ionizing radiation.

radioactivity—The spontaneous discharge of radiation from atomic nuclei. This is usually in the form of beta or alpha radiation, together with gamma radiation. Beta or alpha emission results in transformation of the atom into a different element, changing the atomic number by +1 or -2 respectively.

radioisotope—Radioactive isotope. An unstable isotope of an element that decays or disintegrates spontaneously, emitting radiation. More than 1,300 natural and artificial radioisotopes have been identified.

radionuclide—An unstable nuclide capable of spontaneous transformation into other nuclides by changing its nuclear configuration or energy level. This transformation is accompanied by the emission of photons or particles.

reference material—A material or substance with one or more properties that is sufficiently well established and used to calibrate an apparatus, to assess a measurement method, or to assign values to materials.

release—Any discharge to the environment. Environment is broadly defined as any water, land, or ambient air.

rem—The unit of dose equivalent (absorbed dose in rads multiplied by the radiation quality factor). Dose equivalent is frequently reported in units of millirem (mrem), which is one-thousandth of a rem.

remediation—The correction of a problem. See Environmental Restoration.

Resource Conservation and Recovery Act (RCRA)—Federal legislation that regulates the transport, treatment, and disposal of solid and hazardous wastes.

RFI Program—RCRA Facility Investigation Program; EPA-regulated investigation of a solid waste management unit with regard to its potential impact on the environment.

roentgen—A unit of exposure from X-rays or gamma rays. One roentgen equals 2.58×10^4 coulombs per kilogram of air.

screen zone—In well construction, the section of a formation that contains the screen, or perforated pipe, that allows water to enter the well.

sievert (Sv)—The SI (International System of Units) unit of dose equivalent; 1 Sv = 100 rem.

slurry—A suspension of solid particles (sludge) in water.

source—A point or object from which radiation or contamination emanates.

specific conductance—The ability of water to conduct electricity; this ability varies in proportion to the amount of ionized minerals in the water.

stable—Not radioactive or not easily decomposed or otherwise modified chemically.

storm-water runoff—Surface streams that appear after precipitation.

strata—Beds, layers, or zones of rocks.

substrate—The substance, base, surface, or medium in which an organism lives and grows.

surface water—All water on the surface of the earth, as distinguished from groundwater.

suspended solids—Mixture of fine, nonsettling particles of any solid within a liquid or gas.

terrestrial radiation—Ionizing radiation emitted from radioactive materials, primarily K-40, thorium, and uranium, in the earth's soils. Terrestrial radiation contributes to natural background radiation.

thermoluminescent dosimeter (TLD)—A device used to measure external gamma radiation.

total activity—The total quantity of radioactive decay particles that are emitted from a sample.

total solids—The sum of total dissolved solids and suspended solids.

total suspended particulates—Refers to the concentration of particulates in suspension in the air irrespective of the nature, source, or size of the particulates.

transuranic element (TRU)—An element above uranium in the Periodic Table, that is, with an atomic number greater than 92. All 11 TRUs are produced artificially and are radioactive. They are neptunium, plutonium, americium, curium, berkelium, californium, einsteinium, fermium, mendelevium, nobelium, and lawrencium.

troughing system—A collection and containment system designed to collect leaks of oil that have been contaminated with PCBs.

turbidity—A measure of the concentration of sediment or suspended particles in solution.

upgradient—In the direction of increasing hydrostatic head.

vadose zone—Soil zone located above the water table.

volatile organic compound (VOC)—Any organic compound that has a low boiling point and readily volatilizes into air (e.g., trichloroethane, tetrachloroethene, and trichloroethene).

watershed—The region draining into a river, river system, or body of water.

wetland—A lowland area, such as a marsh or swamp, inundated or saturated by surface or groundwater sufficiently to support hydrophytic vegetation typically adapted to life in saturated soils.

Appendix A

Radiation Overview

This appendix provides basic information about radiation. This information is intended to be a basis for understanding normal radiation dose from sources unassociated with the Paducah Site. People are constantly exposed to radiation. For example, radon in air; potassium in food and water; and uranium, thorium, and radium in the earth's crust are all sources of radiation. The following discussion describes important aspects of radiation, including atoms and isotopes; types, sources, and pathways of radiation; radiation measurement; and dose information.

Atoms and Isotopes

All matter is made up of **atoms**. The atom is thought to consist of a dense central nucleus surrounded by a cloud of electrons. The nucleus is composed of protons and neutrons. Table A.1 summarizes the basic components of an atom. In an electrically neutral atom, the number of protons equals the number of electrons. Atoms can lose or gain electrons through ionization. The number of protons in the nucleus determines an element's atomic number, or chemical identity. With the exception of hydrogen, the nucleus of each type of atom also contains at least one neutron. Unlike protons, the number of neutrons may vary among atoms of the same element. The number of neutrons and protons determines the atomic weight of the atom.

Atoms of the same element with a different number of neutrons are called **isotopes**. Isotopes have the same chemical properties but different atomic weights. Figure A.1 depicts isotopes of the element hydrogen. Uranium, which has 92 protons, is another example of an element that has isotopes. All isotopes of uranium have 92 protons; however, each uranium isotope has a different number of neutrons. Uranium-234 (U-234) has 92 protons and 142 neutrons; U-235 has 92 protons and 143 neutrons; and U-238 has 92 protons and 146 neutrons.

Table A.1. Summary of the Basic Parts of an Atom

Particle	Location	Charge	Comments
Protons	Nucleus	+ positive	The number of protons determines the element. If the number of protons changes, the element changes.
Neutrons	Nucleus	No charge	Atoms of the same element have the same number of protons, but can have a different number of neutrons. This is called an isotope.
Electrons	Orbit nucleus	– negative	This negative charge is equal in magnitude to the proton's positive charge.

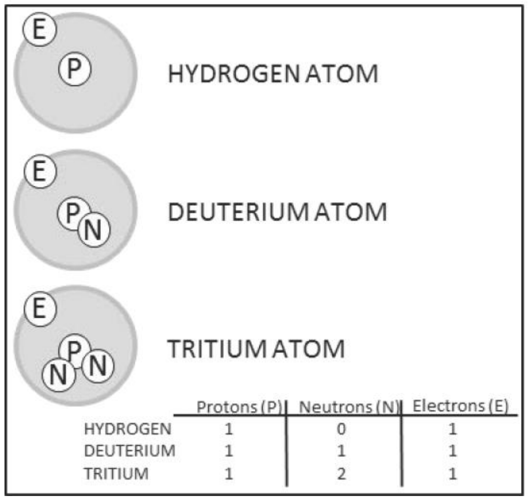

Figure A.1. Isotopes of the Element Hydrogen

Basic Information about Radiation

Radioactivity was discovered in 1896 by the French physicist Antoine Henri Becquerel when he observed that the element uranium can blacken a photographic plate, even when separated from the plate by glass or black paper. In 1898, the French chemists Marie Curie and Pierre Curie concluded that radioactivity is a phenomenon associated with atoms, independent of their physical or chemical state. The Curies measured the heat associated with the decay of radium and established that 1 g (0.035 oz) of radium gives off about 100 cal of energy every hour. This release of energy continues hour after hour and year after year, whereas the complete combustion of a gram of coal results in the production of a total of only about 8,000 cal of energy. Radioactivity attracted the attention of scientists throughout the world, following these early discoveries. In the ensuing decades, many aspects of the phenomenon were thoroughly investigated (Encarta 2002a).

Radiation is energy in the form of waves or particles moving through space. Radiation occurs because unstable atoms give off excess energy to become stable. **Ionization** is the process of removing electrons from neutral atoms. NOTE: Ionization should not be confused with radiation. Ionization is a result of the interaction of radiation with an atom and is what allows the radiation to be detected. **Ionizing radiation** is energy (particles or rays) emitted from radioactive atoms that can cause ionization. Ionizing radiation is capable of displacing electrons and changing the chemical state of matter and, subsequently, causing biological damage; therefore, ionizing radiation is potentially harmful to human health. Examples of ionizing radiation include alpha, beta, and gamma radiation. **Nonionizing radiation** bounces off or passes through matter without displacing electrons. Nonionizing radiation does not have enough energy to ionize an atom. It is unclear whether nonionizing radiation is harmful to human health. Examples include visible light, radar waves, microwaves, and radio waves. **Radioactivity** is the process of unstable or radioactive atoms becoming stable by emitting radiant energy. Radioactivity that occurs over a period of time is called **radioactive decay**. The discovery that radium decays to produce radon proved conclusively that radioactive decay is accompanied by a change in the chemical nature of the decaying element. A **disintegration** is a single atom undergoing radioactive decay. **Radioactive half-life** is the time it takes for one-half of the radioactive atoms present to decay.

Types, Sources, and Pathways of Radiation

Visible light, heat, radio waves, and alpha particles are examples of radiation. When people feel warmth from the sunlight, they actually are absorbing the radiant energy emitted by the sun. Electromagnetic radiation is radiation in the form of electromagnetic waves; examples include gamma rays, ultraviolet light, and radio waves. Particulate radiation is radiation in the form of particles; examples include alpha and beta particles. The spectrum of particle and electromagnetic radiations ranges from the extremely short wavelengths of cosmic rays and electrons to very long radio waves that are hundreds of kilometers in length. Figure A.2 shows the difference between a longer wavelength and a shorter wavelength. Figure A.3 illustrates the wavelengths of several types of radiation along with an example of something that is approximately the same dimension in length.

The radiation’s ability to penetrate material is an important consideration in protecting human health. Adequate shielding decreases the power of radiation by absorbing part or all of it. Figure A.4 shows the different penetrating power of alpha, beta, and gamma rays. Alpha rays are stopped by the thickness of a few sheets of paper or a rubber glove. A few centimeters of wood or a thin sheet of copper stops beta rays. Gamma rays and X-rays require thick shielding of a heavy material, such as iron, lead, or concrete (Encarta 2002b).

Radiation is everywhere. Most occurs naturally, but a small percentage is from man-made sources. Naturally occurring radiation is identical to the radiation resulting from man-made sources.

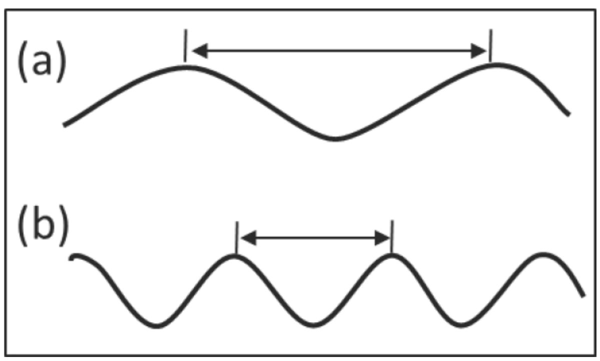

Figure A.2. Comparison between Longer (a) and Shorter (b) Wavelengths[12]

[12] (“Electromagnetic…” 2002, Appendix A references)

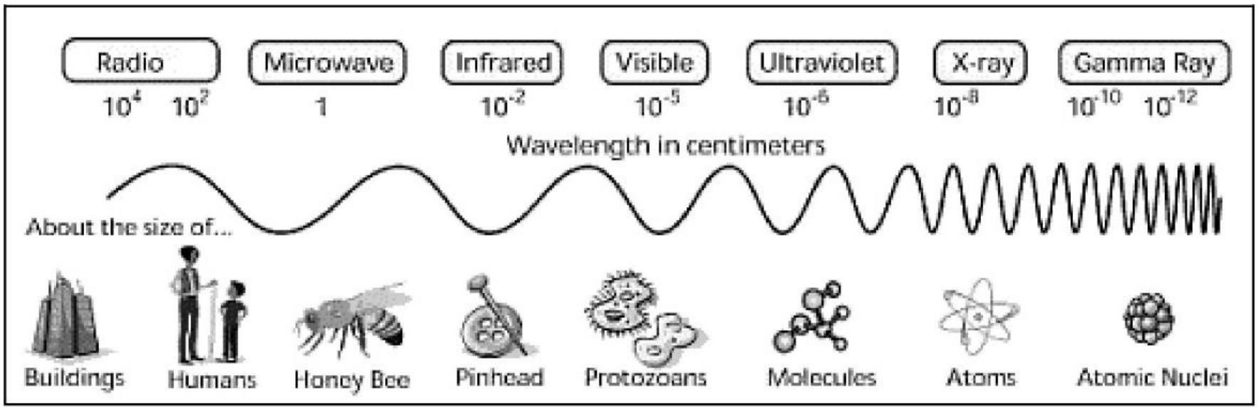

Figure A.3. The Approximate Wavelengths of the Various Regions of the Electromagnetic Spectrum and an Example of Something that is Approximately the Same Size[13]

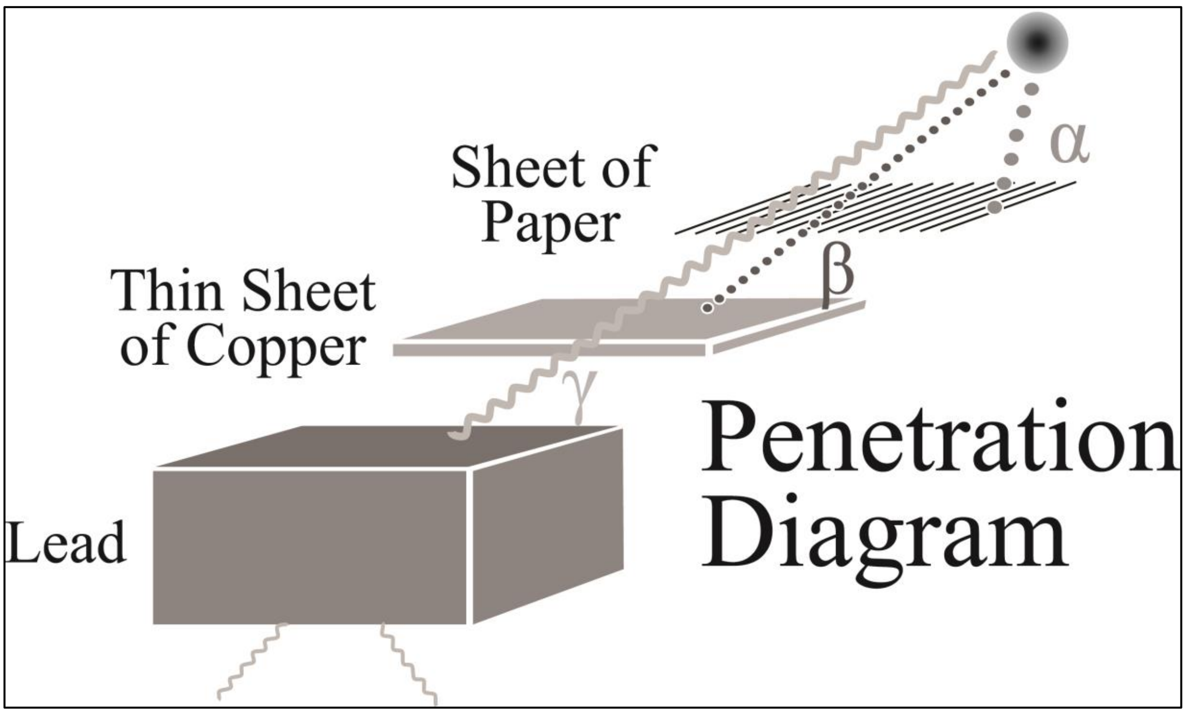

Figure A.4. The Penetrating Potential of the Three Types of Ionizing Radiation: Alpha (α), Beta (β), and Gamma (γ)[14]

Naturally occurring radiation is known as **background radiation**. In fact, this naturally occurring radiation is the major source of radiation in the environment. People have little control over the amount of background radiation to which they are exposed. Background radiation remains relatively constant over time. The amount of background radiation present in the environment today is much the same as it was

[13] ("Exploring …" 2002, Appendix A references)
[14] ("Experiment…" 2002, Appendix A references)

hundreds of years ago. Sources of background radiation include uranium in the earth, radon in the air, and potassium in food. Depending on its origin, background radiation is categorized as cosmic, terrestrial, or internal. **Cosmic radiation** comes from the sun and outer space and is made up of energetically charged particles from that continuously hit the earth's atmosphere. Because the atmosphere provides some shielding against cosmic radiation, the intensity of cosmic radiation increases with altitude above sea level. Therefore, a person in Denver, Colorado, is exposed to more cosmic radiation than a person in Paducah, Kentucky. **Terrestrial radiation** refers to radiation emitted from radioactive materials in the earth's rocks, soils, and minerals. Radon (Rn); radon progeny, the relatively short-lived decay products of radium-235 (Ra-235); potassium (K-40); isotopes of thorium (Th); and isotopes of uranium (U) are the elements responsible for most terrestrial radiation. **Internal radiation** is radiation that is inside the body and is in close contact with body tissue. Internal radiation can deposit large amounts of energy in a small amount of tissue. Radioactive material in the environment enters the body through the air people breathe, the food they eat, and even through an open wound. Natural radionuclides in the body include isotopes of U, Th, Ra, Rn, Pu, bismuth (Bi), and lead in the U-238 and Th-212 decay series.

In addition, the body contains isotopes of sodium-24 (Na-24), K-40, rubidium (Rb), and carbon-14 (C-14). Most of our internal exposure comes from K-40. In addition to background radiation, there are man-made sources of radiation to which most people are exposed. Examples include consumer products, medical sources, and other sources. Some **consumer products** are sources of radiation. In some of these products, such as smoke detectors and airport X-ray baggage inspection systems, the radiation is essential to the performance of the device. In other products, such as televisions and tobacco products, the radiation occurs incidentally to the product function. **Medical sources** of radiation account for the majority of the exposure people receive from man-made radiation. Radiation is an important tool of diagnostic medicine and treatment. Exposure is deliberate and directly beneficial to the patients exposed. Generally, diagnostic or therapeutic medical exposures result from X-ray beams directed to specific areas of the body. Thus, all body organs generally are not irradiated uniformly.

Radiation and radioactive materials are also used in a wide variety of pharmaceuticals and in the preparation of medical instruments, including the sterilization of heat-sensitive products such as plastic heart valves. Nuclear medical examinations and treatment involve the internal administration of radioactive compounds, or radiopharmaceuticals, by injection, inhalation, consumption, or insertion. Even then, radionuclides are not distributed uniformly throughout the body. **Other sources** of radiation include fallout from atmospheric atomic weapons tests; emissions of radioactive materials from nuclear facilities such as uranium mines, fuel processing plants, and nuclear power plants; emissions from mineral extraction facilities; and transportation of radioactive materials. Atmospheric testing of atomic weapons has been suspended. Radiation and radioactive material in the environment can reach people through many routes. Potential routes for radiation are referred to as **pathways**. Several radiation pathways are shown in Figure A.5. For example, radioactive material in the air could fall on a pasture. Cows could then eat the grass, and the radioactive material on the grass would show up in the cow's milk. People drinking the milk would thus be exposed to this radiation, or people could simply inhale the radioactive material in the air. The same events could occur with radioactive material in water. Fish living in the water would be exposed. People eating the fish would then be exposed to the radiation in the fish, or people swimming in the water would be exposed.

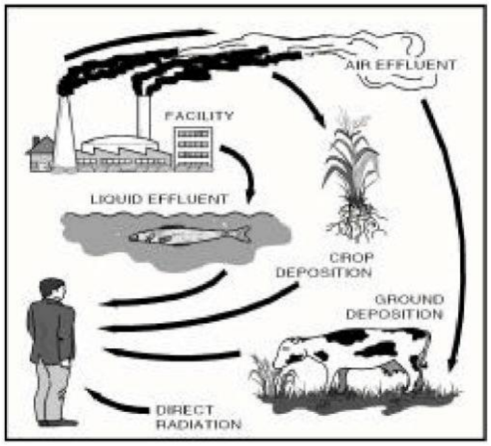

Figure A.5. Possible Radiation Pathways

Measuring Radiation

To determine the possible effects of radiation on the environment and the health of people, the radiation must be measured. More precisely, its potential to cause damage must be determined. When measuring the amount of radiation in the environment, what actually is being measured is the rate of radioactive decay, or **activity**. The rate of decay varies widely among the various radioisotopes. For that reason, 1 g of one radioactive substance may contain the same amount of activity as several tons of another substance. Activity is measured by the number of disintegrations a radioactive material undergoes in a certain period of time. In the United States, activity is expressed in a unit of measure known as a **curie (Ci)**. In the international system of units, activity is expressed in a unit of measure known as a **becquerel (Bq)**. One disintegration per second (dps) equals one becquerel (Bq). One curie equals:

- 37,000,000,000 atom disintegrations per second (3.7×10^{10} dps)
- 37,000,000,000 becquerels (3.7×10^{10} Bq)
- 1,000,000 microcuries (1×10^{6} μCi)

Dose Information

The total amount of energy absorbed per unit mass as a result of exposure to radiation is expressed in a unit of measure known as a **radiation absorbed dose (rad)**. In the international system of units, 100 rad = 1 gray. However, in terms of human health, it is the effect of the absorbed energy that is important because some forms of radiation are more harmful than others. The unit, rad, does not take into account the potential effects that different types of radiation have on the body. The measure of potential biological damage caused by exposure to and subsequent absorption of radiation is expressed in a unit of measure known as a **roentgen equivalent man (rem)**. One rem of any type of radiation has the same total damaging effect and pertains to the human body. Dose is expressed in millirems (mrem), because a rem represents a fairly large dose. One millirem is equal to 1/1000 rem. The International System of Units uses the **Sievert (Sv)**, l00 rem = 1 Sievert (Sv), 100 mrem = 1 millisievert (mSv).

Many terms are used to report dose, as listed in Table A.2. Several factors are taken into account, including the amount of radiation absorbed, the organ absorbing the radiation, and the effect of the radiation over a 50-year period. The term "dose," in this report, includes committed effective dose

Table A.2. Dose Terminology

Term	Description
absorbed dose	Quantity of radiation energy absorbed by an organ divided by an organ's mass.
dose equivalent	Absorbed dose to an organ multiplied by a quality factor.
effective dose equivalent	Single weighted sum of combined dose equivalent received by all organs. This term will be replaced with effective dose for the 2013 ASER.
committed dose equivalent	Effective dose equivalent to an organ over a 50-year period following intake. This term will be replaced with dose equivalent for the 2013 ASER.
committed effective dose equivalent	Total effective dose equivalent to all organs in the human body over a 50-year period following intake. This term will be replaced with committed effective dose for the 2013 ASER.
collective effective dose equivalent	Sum of effective dose equivalents of all members of a given population. This term will be replaced with collective effective dose for the 2013 ASER.
quality factor	A modifying factor used to adjust for the effect of the type of radiation, for example, alpha particles or gamma rays, on tissue.
weighting factor	Tissue-specific modifying factor representing the fraction of the total health risk from uniform, whole-body exposure.

equivalent attributable to radiation sources inside the body and the effective does equivalent (EDE) attributable to penetrating radiation from sources external to the body. In the calendar year 2013 Annual Site Environmental Report (ASER), these terms will be revised to reflect current guidance from the International Commission on Radiation Protection. The new terms, committed effective dose and effective dose, are synonymous for the purposes of this report.

Determining dose is an involved process using complex mathematical equations based on several factors, including the type of radiation, the rate of exposure, weather conditions, and typical diet. Basically, radiant energy is generated from radioactive decay or activity. People absorb some of the energy to which they are exposed. This absorbed energy is calculated as part of an individual's dose. Whether radiation is natural or human made, its effects on people are the same.

A comparison of some dose levels is presented in Table A.3. Included is an example of the type of exposure that may cause such a dose or the special significance of such a dose. This information is intended to help the reader become familiar with the type of doses individuals may receive. The average annual dose received by residents of the United States from cosmic radiation is about 33 mrem (0.33 mSv) (NCRP 2009). The average annual dose from cosmic radiation received by residents in the Paducah area is about 45 mrem (0.45 mSv). The average annual dose received from terrestrial gamma radiation in the United States is about 21 mrem (0.21 mSv). The terrestrial dose varies geographically across the country (NCRP 2009); typical reported values are 16 mrem (0.16 mSv) at the Atlantic and Gulf coastal plains and 63 mrem (0.63 mSv) at the eastern slopes of the Rocky Mountains. In the Paducah area, background levels of radionuclides in soils are within typical levels indicating that the dose received from terrestrial gamma radiation is within the range of typical reported values (DOE 1988). The major contributors to the annual dose equivalent for internal radionuclides are the short-lived decay products of radon, mostly Rn-222. They contribute an average dose of about 212 mrem (2.12 mSv) per year. The average dose from other internal radionuclides is about 45 mrem (0.45 mSv) per year, most of which can be attributed to the naturally occurring isotope of potassium, K-40. The concentration of radioactive potassium in human tissues is similar in all parts of the world. Table A.4 presents the internal dose factors for an adult. The United States average annual dose received by an individual from consumer products is about 13 mrem (0.13 mSv) (NCRP 2009). The dose from medical sources includes nuclear medicine examinations using radiopharmaceuticals, computed tomography, and fluoroscopic diagnostic

Table A.3. Comparison and Description of Various Dose Levels

Dose Level	Description
1 mrem (0.01 mSv)	Approximate daily dose from natural background radiation, including radon.
2.5 mrem (0.025 mSv)	Cosmic dose to a person on a one-way airplane flight from New York to Los Angeles.
10 mrem (0.10 mSv)	Annual exposure limit set by the EPA for exposures from airborne emissions from operations of nuclear fuel cycle facilities, including power plants and uranium mines and mills.
45 mrem (0.45 mSv)	Average yearly dose from cosmic radiation received by people in the Paducah area.
46 mrem (0.46 mSv)	Estimate of the largest dose any off-site person could have received from the March 28, 1979, Three Mile Island nuclear power plant accident.
66 mrem (0.66 mSv)	Average yearly dose to people in the U.S. from man-made sources.
100 mrem (1.00 mSv)	Annual limit of dose from all DOE facilities to a member of the public who is not a radiation worker.
110 mrem (1.10 mSv)	Average occupational dose received by U.S. commercial radiation workers in 1980.
244 mrem (2.44 mSv)	Average dose from an upper gastrointestinal diagnostic X-ray series.
300 mrem (3.00 mSv)	Average yearly dose to people in the U.S. from all sources of natural background radiation.
1–5 rem (0.01-0.05 Sv)	EPA protective action guidelines state that public officials should take emergency action when the dose to a member of the public from a nuclear accident will likely reach this range.
5 rem (0.05 Sv)	Annual limit for occupational exposure of radiation workers set by NRC and DOE.
10 rem (0. 10 Sv)	The BEIR V report estimated that an acute dose at this level would result in a lifetime excess risk of death from cancer, caused by the radiation, of 0.8%.
25 rem (0.25 Sv)	EPA guideline for voluntary maximum dose to emergency workers for non-lifesaving work during an emergency.
75 rem (0.75 Sv)	EPA guideline for maximum dose to emergency workers volunteering for lifesaving work.
50–600 rem (0.50-6.00 Sv)	Doses in this range received over a short period of time will produce radiation sickness in varying degrees. At the lower end of this range, people are expected to recover completely, given proper medical attention. At the top of this range, most people would die within 60 days.

Adapted from *Savannah River Site Environmental Report for 1993* (SRS 1994).

Table A.4. Internal Dose Factors for an Adult

		Intake[a]			
Isotope	Half-life (years)	Inhalation (soluble) (mrem/pCi)	Inhalation (slightly soluble) (mrem/pCi)	Inhalation (insoluble) (mrem/pCi)	Ingestion (mrem/pCi)
Am-241	430	NA	5.2E-01	NA	3.64E-03
Cs-137	30	3.2E-05	NA	NA	5.00E-05
Co-60	5.3	NA	3.0E-05	1.5E-04	1.02E-05
Np-237	2,140,000	NA	4.9E-01	NA	4.44E-03
Pu-239/240	24,000	NA	5.1E-01	3.3E-01	5.18E-05
K-40	1,260,000,000	1.2E-05	NA	NA	1.86E-05
Tc-99	212,000	8.4E-07	7.5E-06	1.2E-01	1.46E-06
Th-230	80,000	UN	3.2E-01	2.6E-01	5.48E-04
U-234	247,000	2.7E-03	7.1E-03	1.3E-01	2.83E-04
U-235	710,000,000	2.5E-03	6.7E-03	1.2E-01	2.66E-04
U-238	4,510,000,000	2.4E-03	6.2E-03	1.2E-01	2.55E-04

[a] Sources: DOE 1988. *Internal Dose Conversion Factors for Calculations of Dose to the Public*, DOE/EH-0071, July.
EPA 1988. *Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion*, EPA-520/1-88-020, September.
NA = not available in the above-referenced documents

procedures, which generally account for the largest portion of the dose received from man-made sources. In these cases, comparisons are made using the concept of EDE, which relates exposure of organs or body parts to one effective whole-body dose. The average annual EDE from medical examinations is 300 mrem (3.00 mSv), including 33 mrem (0.33 mSv) for diagnostic X-rays and 147 mrem (1.47 mSv) for computed tomography scans, 43 mrem (0.43 mSv) for interventional fluoroscopy, and 77 mrem (0.77 mSv) for nuclear medicine procedures (NCRP 2006). The actual doses received by individuals who complete such medical exams are much higher than these values, but not everyone receives such exams each year (NCRP 2006). The dose from other sources include small doses received by individuals that occur as a result of radioactive fallout from atmospheric atomic weapons tests, emissions of radioactive materials from nuclear facilities, emissions from certain mineral extraction facilities, and transportation of radioactive materials. The combination of these sources contributes less than 1 mrem (0.01 mSv) per year to the average dose to an individual (NCRP 2006). The average occupational dose received in 2006 for all monitored radiation workers (including medical, aviation, government, and industrial sectors) was less than 100 mrem (0.10 mSv). This is consistent with doses reported for 2003 through 2005. The average dose reported for DOE workers in 2006 was 63 mrem (0.63 mSv) (NCRP 2006).

Appendix A References

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Appendix B

Radionuclide and Chemical Nomenclature

Table B.1. Half-Life and Derived Concentration Guide for Selected Radionuclides

Radionuclide	Symbols		Half-life	Ingested Water DCG (µCi/ml)	Ingested Water DCS (µCi/ml)
Americium-241	^{241}Am	Am-241	432 years	3E-08	2E-07
Bismuth-210	^{210}Bi	Bi-210	5.01 days	2E-05	2E-05
Cesium-137	^{137}Cs	Cs-137	30.2 years	3E-06	3E-06
Cobalt-60	^{60}Co	Co-60	5.3 years	1E-05	7E-06
Lead-206	^{206}Pb	Pb-206	Stable	None	None
Lead-210	^{210}Pb	Pb-210	21 years	3E-08	4E-08
Lead-214	^{214}Pb	Pb-214	26.8 minutes	2E-04	2E-04
Neptunium-237	^{237}Np	Np-237	2,140,000 years	3E-08	3E-07
Plutonium-239	^{239}Pu	Pu-239	24,110 years	3E-08	1E-07
Polonium-210	^{210}Po	Po-210	138.9 days	8E-08	2E-08
Polonium-214	^{214}Po	Po-214	164 microseconds	None	None
Polonium-218	^{218}Po	Po-218	3.05 minutes	None	None
Potassium-40	^{40}K	K-40	1,260,000,000 years	7E-06	5E-06
Protactinium-234m	^{234m}Pa	Pa-234m	1.17 minutes	None	None
Radium-226	^{226}Ra	Ra-226	1,602 years	1E-07	9E-08
Radon-222	^{222}Rn	Rn-222	3.821 days	None	None
Technetium-99	^{99}Tc	Tc-99	212,000 years	1E-04	4E-05
Thorium-228	^{228}Th	Th-228	1.9 years	4E-07	3E-07
Thorium-230	^{230}Th	Th-230	80,000 years	3E-07	2E-07
Thorium-231	^{231}Th	Th-231	25.5 hours	1E-04	9E-05
Thorium-234	^{234}Th	Th-234	24.1 days	1E-05	8E-06
Uranium-234	^{234}U	U-234	247,000 years	5E-07	7E-07
Uranium-235	^{235}U	U-235	710,000,000 years	6E-07	7E-07
Uranium-236	^{236}U	U-236	23,900,000 years	5E-07	7E-07
Uranium-238	^{238}U	U-238	4,510,000,000 years	6E-07	7E-07

Derived Concentration Guide (DCG) is the concentration of a radionuclide in air or water that would result in an effective dose equivalent of 100 mrem under conditions of continuous exposure for one year by one exposure mode (i.e., ingestion of water, submersion in air, or inhalation). DCGs do not consider decay products when the parent radionuclide is the cause of the exposure. DCGs were taken from DOE Order 5400.5, dated February 8, 1990. DOE Order 458.1 replaced Order 5400.5 on February 11, 2011, and will be implemented in 2013 under LATA Kentucky contract DE-AC30-10CC40020. DOE Order 458.1 uses derived concentration technical standards (DCSs) as the standard for evaluating dose. DCSs are quantities used in the design and conduct of radiological environmental protection programs at DOE facilities and sites. These quantities represent the concentration of a given radionuclide in either water or air that results in a member of the public receiving 100 mrem effective dose following continuous exposure for one year for each of the following pathways: ingestion of water, submersion in air, and inhalation. DCSs were taken from DOE-STD-1196-2011, dated April 2011.

Table B.2. Nomenclature for Elements and Chemical Compounds

Constituent	Symbol	Constituent	Symbol
Aluminum	Al	Mercury	Hg
Ammonia	NH_3	Nickel	Ni
Antimony	Sb	Nitrate	NO_3^-
Arsenic	As	Nitrite	NO_2^-
Barium	Ba	Nitrogen	N
Beryllium	Be	Oxygen	O
Cadmium	Cd	Ozone	O_3
Calcium	Ca	Phosphate	PO_4^{3-}
Calcium carbonate	$CaCO_3$	Phosphorus	P
Carbon	C	Potassium	K
Chlorine	Cl	Radium	Ra
Chromium	Cr	Radon	Rn
Chromium, hexavalent	Cr^{6+}	Selenium	Se
Cobalt	Co	Silver	Ag
Copper	Cu	Sodium	Na
Fluorine	F	Sulfate	SO_4^{2-}
Hydrogen fluoride	HF	Sulfur dioxide	SO_2
Iron	Fe	Trichloroethene	TCE
Lead	Pb	Thorium	Th
Lithium	Li	Uranium	U
Magnesium	Mg	Uranium hexafluoride	UF_6
Manganese	Mn	Zinc	Zn

Appendix C

Monitoring Data

This appendix provides monitoring results in table form of the radiological effluent data, the radiological environmental surveillance data, the nonradiological effluent data, and the nonradiological environmental surveillance data. Data contained in this appendix are included within summary tables in the main text of this report. Monitoring results are presented for surface water, sediment, and air.

The following notes should help the reader's understanding of the data presented in the tables included in this appendix.

1. Monitoring programs often include measurement of extremely low concentrations of radionuclides, below the detection limit of the counting instruments. Less-than-detectable data will produce numerical measurements with values below the detection limit and sometimes negative values. All of the actual values, including those that are negative, are included in the statistical analyses in accordance with the U.S. Department of Energy's *Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance*.

2. The following data tables include monitoring results for surface water, sediment, and air. Groundwater results are not presented in this appendix because more significant detail and data tables are presented in the main text of this report.

3. Laboratory qualifiers presented in the data tables indicate the following:

*	INORGANICS: Duplicate analysis was not within control limits; ORGANICS: Surrogate values outside of control limits.
<	Numerical value reported was less than the requested reporting limit.
B	INORGANICS: Value was less than the contract required detection limit or required reporting limit specified, but greater than or equal to the instrument detection limit/method detection limit; ORGANICS: compound was found in the associated blank as well as in the sample.
D	Identified in an analysis at a secondary dilution.
J	Estimated quantitation.
L	Reported measurement is associated with a negative blank.
M	Matrix spike recovery is < 80% or > 120%.
N	INORGANICS: Spike recovery not within control limits; ORGANICS: Applied to tentatively identified compound results that are reported as specific compounds based on a mass spectral library search.
T	Tracer recovery is < 20% or > 105%.
U	NONRADIONUCLIDES: Not detected; RADIONUCLIDES: value reported is less than the minimum detectable activity (MDA) and/or total propagated uncertainty (TPU).
X	Used when more than five qualifiers are required for a result.
Y	Chemical yield exceeds acceptance limits.

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C.1. RADIOLOGICAL EFFLUENT DATA

KPDES Radiological Data

Table C.1.1. Radiological Effluent Data for Outfall 001

Analysis	Units	Result	MDA	TPU	Lab Qualifiers	Date Collected	
Alpha activity	pCi/L	-4.34	17.5	3.44	UX	1/3/2012	
Alpha activity	pCi/L	-3.22	13.6	1.82	U	1/9/2012	
Alpha activity	pCi/L	8.01	12	3.23	U	1/17/2012	
Alpha activity	pCi/L	22.8	10.1	7.09		1/23/2012	
Alpha activity	pCi/L	2.79	14.3	1.36	U	1/30/2012	
Alpha activity	pCi/L	8.69	8.81	3.17	U	2/6/2012	
Alpha activity	pCi/L	1.06	10	0.494	U	2/13/2012	
Alpha activity	pCi/L	3.19	10	1.4	U	2/20/2012	
Alpha activity	pCi/L	4.24	16.9	2.48	UX	2/27/2012	
Alpha activity	pCi/L	1.64	17.2	0.99	U	3/5/2012	
Alpha activity	pCi/L	-2.53	16.8	1.79	U	3/12/2012	
Alpha activity	pCi/L	3.31	17.5	1.94	U	3/19/2012	
Alpha activity	pCi/L	12.8	16.9	6.35	U	3/26/2012	
Alpha activity	pCi/L	2.93	19.1	1.7	UX	4/3/2012	
Alpha activity	pCi/L	5.12	19.1	2.88	UX	4/9/2012	
Alpha activity	pCi/L	5.2	19.4	2.83	UX	4/16/2012	
Alpha activity	pCi/L	-8.13	21.4	6.78	UX	4/24/2012	
Alpha activity	pCi/L	8.11	21.1	4.32	U	5/1/2012	Duplicate
Alpha activity	pCi/L	0.922	20.6	0.57	U	5/1/2012	
Alpha activity	pCi/L	5.35	23.3	3.01	U	5/7/2012	
Alpha activity	pCi/L	9.34	22.3	5.44	U	5/14/2012	
Alpha activity	pCi/L	-6.34	23	3.38	U	5/21/2012	
Alpha activity	pCi/L	3.99	20.9	1.8	U	5/29/2012	
Alpha activity	pCi/L	2.74	19.3	1.27	U	6/4/2012	
Alpha activity	pCi/L	-0.041	21.1	0.0264	UX	6/11/2012	
Alpha activity	pCi/L	15.1	21	7.4	UX	6/18/2012	
Alpha activity	pCi/L	3.74	25.2	2.31	UX	6/25/2012	
Alpha activity	pCi/L	-3.18	21.7	2.13	U	7/2/2012	
Alpha activity	pCi/L	-1.06	19.7	0.679	UX	7/9/2012	
Alpha activity	pCi/L	-2.37	19.3	1.59	UX	7/16/2012	
Alpha activity	pCi/L	9.13	22.8	4.99	UX	7/23/2012	
Alpha activity	pCi/L	10.1	20.8	5.39	UX	7/30/2012	
Alpha activity	pCi/L	-0.441	18.1	0.283	U	8/6/2012	
Alpha activity	pCi/L	1.81	18.6	1.12	U	8/13/2012	
Alpha activity	pCi/L	2.56	17.7	1.53	U	8/20/2012	
Alpha activity	pCi/L	7.27	17.8	3.87	UX	8/27/2012	
Alpha activity	pCi/L	17.7	24.3	8.55	UX	9/4/2012	
Alpha activity	pCi/L	0.963	25	0.634	UX	9/10/2012	
Alpha activity	pCi/L	0.0294	17.1	0.017	U	9/17/2012	
Alpha activity	pCi/L	0.239	18.7	0.143	U	9/24/2012	
Alpha activity	pCi/L	-6.71	19.5	5.29	UX	10/1/2012	
Alpha activity	pCi/L	-6.83	20.3	5.38	UX	10/8/2012	
Alpha activity	pCi/L	0.7	21.4	0.419	U	10/15/2012	
Alpha activity	pCi/L	-0.958	23.1	0.593	U	10/22/2012	
Alpha activity	pCi/L	-4.6	28.5	3.08	U	10/29/2012	
Alpha activity	pCi/L	3.06	21.6	1.79	U	11/5/2012	

Table C.1.1. Radiological Effluent Data for Outfall 001 (Continued)

Analysis	Units	Result	MDA	TPU	Lab Qualifiers	Date Collected	
Alpha activity	pCi/L	15.9	19.2	7.38	U	11/13/2012	Duplicate
Alpha activity	pCi/L	16.3	19.6	7.46	U	11/13/2012	
Alpha activity	pCi/L	8.67	20	4.4	U	11/19/2012	
Alpha activity	pCi/L	2.09	25.8	1.43	U	11/26/2012	
Alpha activity	pCi/L	-7.85	20.2	6.57	UX	12/3/2012	
Alpha activity	pCi/L	25.1	17.7	10.2	X	12/10/2012	
Alpha activity	pCi/L	-5.7	22.6	4.03	UX	12/17/2012	
Alpha activity	pCi/L	37.2	21.6	15.3	X	12/27/2012	
Beta activity	pCi/L	32.9	16	6.33	X	1/3/2012	
Beta activity	pCi/L	46.5	12.3	6.95		1/9/2012	
Beta activity	pCi/L	25.4	11.7	3.34		1/17/2012	
Beta activity	pCi/L	19.8	11	2.67		1/23/2012	
Beta activity	pCi/L	37.2	16.7	5.94		1/30/2012	
Beta activity	pCi/L	23.2	8.71	2.96		2/6/2012	
Beta activity	pCi/L	22.1	9.24	2.87		2/13/2012	
Beta activity	pCi/L	19.7	9.23	2.59		2/20/2012	
Beta activity	pCi/L	38.7	15.8	7.23		2/27/2012	
Beta activity	pCi/L	49.3	15.9	8.83	L	3/5/2012	
Beta activity	pCi/L	40	15.8	7.42	L	3/12/2012	
Beta activity	pCi/L	38.4	16.5	6.89		3/19/2012	
Beta activity	pCi/L	31.1	16.3	5.78		3/26/2012	
Beta activity	pCi/L	43.5	17.1	8.09		4/3/2012	
Beta activity	pCi/L	32.4	17.1	6.29		4/9/2012	
Beta activity	pCi/L	33.4	17.2	6.47		4/16/2012	
Beta activity	pCi/L	33.4	17.6	6.48		4/24/2012	
Beta activity	pCi/L	37.8	17.1	6.95		5/1/2012	
Beta activity	pCi/L	42.1	17.2	7.62		5/1/2012	Duplicate
Beta activity	pCi/L	45.5	17.6	8.16		5/7/2012	
Beta activity	pCi/L	28.7	18.4	4.78		5/14/2012	
Beta activity	pCi/L	54.9	19.5	8.24		5/21/2012	
Beta activity	pCi/L	49.9	19	7.55		5/29/2012	
Beta activity	pCi/L	37.7	18.6	5.88		6/4/2012	
Beta activity	pCi/L	34.4	17.2	6.43		6/11/2012	
Beta activity	pCi/L	33	17.2	6.2		6/18/2012	
Beta activity	pCi/L	24.2	24.3	4.97	U	6/25/2012	
Beta activity	pCi/L	42	17.3	7.6		7/2/2012	
Beta activity	pCi/L	35.6	16.9	6.59		7/9/2012	
Beta activity	pCi/L	35	16.8	6.49		7/16/2012	
Beta activity	pCi/L	27.9	23.6	5.6		7/23/2012	
Beta activity	pCi/L	23.5	22.9	4.8		7/30/2012	
Beta activity	pCi/L	27.8	16.5	5.33		8/6/2012	
Beta activity	pCi/L	20.1	16.6	4.03		8/13/2012	
Beta activity	pCi/L	23.8	16.4	4.65		8/20/2012	
Beta activity	pCi/L	28.7	13.3	5.29		8/27/2012	
Beta activity	pCi/L	25.4	10.5	4.53		9/4/2012	
Beta activity	pCi/L	17.1	10.6	3.25		9/10/2012	
Beta activity	pCi/L	30.9	13.5	5.57		9/17/2012	
Beta activity	pCi/L	21	13.8	4.02		9/24/2012	
Beta activity	pCi/L	30.2	17.3	5.67		10/1/2012	
Beta activity	pCi/L	28.3	17.5	5.37		10/8/2012	
Beta activity	pCi/L	34.2	17.7	6.32		10/15/2012	
Beta activity	pCi/L	36.7	18.1	6.74		10/22/2012	

Table C.1.1. Radiological Effluent Data for Outfall 001 (Continued)

Analysis	Units	Result	MDA	TPU	Lab Qualifiers	Date Collected	
Beta activity	pCi/L	45.7	25.7	8.55		10/29/2012	
Beta activity	pCi/L	29.3	16.8	4.56		11/5/2012	
Beta activity	pCi/L	25.9	16.6	4.11		11/13/2012	Duplicate
Beta activity	pCi/L	35	16.7	5.3		11/13/2012	
Beta activity	pCi/L	40.1	16.7	5.92		11/19/2012	
Beta activity	pCi/L	30.7	25.7	6.01		11/26/2012	
Beta activity	pCi/L	35.2	16.7	5.32		12/3/2012	
Beta activity	pCi/L	39.5	16.5	5.84		12/10/2012	
Beta activity	pCi/L	46.4	17.9	8.27		12/17/2012	
Beta activity	pCi/L	39.4	15	7.06		12/27/2012	
Technetium-99	pCi/L	5.37	16.6	11.9	U	1/3/2012	
Technetium-99	pCi/L	3.91	15.5	11.1	U	4/3/2012	
Technetium-99	pCi/L	1.14	18.9	13.1	U	7/2/2012	
Technetium-99	pCi/L	-4.18	18.9	12.2	U	7/2/2012	Duplicate
Technetium-99	pCi/L	12.7	16.5	12.5	U	10/1/2012	

Table C.1.2. Radiological Effluent Data for Outfall 015

Analysis	Units	Result	MDA	TPU	Lab Qualifiers	Date Collected	
Alpha activity	pCi/L	12.1	9.04	4.7		1/11/2012	
Alpha activity	pCi/L	39.2	5.31	11.8		2/29/2012	
Alpha activity	pCi/L	13.9	5	5.12		3/8/2012	
Alpha activity	pCi/L	10.3	5.39	3.92		10/18/2012	
Alpha activity	pCi/L	8.32	3.79	2.97		11/12/2012	
Alpha activity	pCi/L	7.52	5.08	3.18		12/20/2012	
Alpha activity	pCi/L	13.2	5.1	4.93		12/20/2012	Duplicate
Beta activity	pCi/L	19	14.2	3.2		1/11/2012	
Beta activity	pCi/L	31.1	5.63	4.98		2/29/2012	
Beta activity	pCi/L	23.6	5.53	3.97	L	3/8/2012	
Beta activity	pCi/L	17.2	5.93	2.98		10/18/2012	
Beta activity	pCi/L	16.7	5.53	2.36		11/12/2012	
Beta activity	pCi/L	13.9	5.8	2.51		12/20/2012	
Beta activity	pCi/L	9.8	5.81	1.87		12/20/2012	Duplicate
Technetium-99	pCi/L	18.5	15.9	11.9		1/11/2012	
Technetium-99	pCi/L	5.3	15.9	11.5	U	1/11/2012	Duplicate
Technetium-99	pCi/L	3.69	15.2	10.7	U	10/18/2012	

KPDES Radiological Data

Table C.1.3. Radiological Effluent Data for Outfall 017

Analysis	Units	Result	MDA	TPU	Lab Qualifiers	Date Collected	
Alpha activity	pCi/L	1.53	2.88	0.691	U	1/11/2012	
Alpha activity	pCi/L	1.46	2.87	0.667	U	1/11/2012	Duplicate
Alpha activity	pCi/L	3.74	6.32	2.02	U	2/27/2012	
Alpha activity	pCi/L	0.416	6.23	0.281	U	2/27/2012	Duplicate
Alpha activity	pCi/L	-1.19	4.94	1.1	U	3/9/2012	Duplicate
Alpha activity	pCi/L	0.587	5.03	0.396	U	3/9/2012	
Alpha activity	pCi/L	1.61	4.26	0.875	U	4/16/2012	
Alpha activity	pCi/L	0.647	4.25	0.39	U	4/16/2012	Duplicate
Alpha activity	pCi/L	2.2	4.7	1.28	U	5/21/2012	Duplicate
Alpha activity	pCi/L	0.81	4.62	0.532	U	5/21/2012	
Alpha activity	pCi/L	1.47	5.49	0.852	U	6/5/2012	Duplicate
Alpha activity	pCi/L	-0.434	5.73	0.305	U	6/5/2012	
Alpha activity	pCi/L	8.84	9.5	4.17	U	7/9/2012	
Alpha activity	pCi/L	0.651	7.34	0.402	U	8/27/2012	Duplicate
Alpha activity	pCi/L	2.44	7.01	1.37	U	8/27/2012	
Alpha activity	pCi/L	2.66	8.67	1.56	U	9/4/2012	
Alpha activity	pCi/L	0.81	8.8	0.533	U	9/4/2012	Duplicate
Alpha activity	pCi/L	-1.72	6.25	1.36	U	10/3/2012	
Alpha activity	pCi/L	0.36	6.19	0.223	U	10/3/2012	Duplicate
Alpha activity	pCi/L	0.154	3.86	0.102	U	11/12/2012	
Alpha activity	pCi/L	-1.06	5.7	0.825	U	12/3/2012	
Beta activity	pCi/L	3.71	3.88	0.642	U	1/11/2012	Duplicate
Beta activity	pCi/L	5.77	3.88	0.962		1/11/2012	
Beta activity	pCi/L	7.19	5.93	1.49		2/27/2012	
Beta activity	pCi/L	6.84	5.9	1.43		2/27/2012	Duplicate
Beta activity	pCi/L	3.23	5.54	0.722	LU	3/9/2012	
Beta activity	pCi/L	2	5.51	0.462	LU	3/9/2012	Duplicate
Beta activity	pCi/L	4.7	5.49	0.999	U	4/16/2012	
Beta activity	pCi/L	5.12	5.49	1.08	U	4/16/2012	Duplicate
Beta activity	pCi/L	7.71	5.29	1.3		5/21/2012	
Beta activity	pCi/L	6.44	5.31	1.11		5/21/2012	Duplicate
Beta activity	pCi/L	6.51	5.9	1.32		6/5/2012	
Beta activity	pCi/L	7.5	5.82	1.49		6/5/2012	Duplicate
Beta activity	pCi/L	9.35	11.1	1.95	U	7/9/2012	
Beta activity	pCi/L	10.7	6.32	2.04		8/27/2012	Duplicate
Beta activity	pCi/L	7.06	6.25	1.43		8/27/2012	
Beta activity	pCi/L	4.28	4.8	0.873	U	9/4/2012	Duplicate
Beta activity	pCi/L	4.88	4.77	0.982		9/4/2012	
Beta activity	pCi/L	4.18	6.18	0.871	U	10/3/2012	Duplicate
Beta activity	pCi/L	4.03	6.2	0.843	U	10/3/2012	
Beta activity	pCi/L	3.99	5.57	0.692	U	11/12/2012	
Beta activity	pCi/L	5.16	6.06	0.881	U	12/3/2012	
Technetium-99	pCi/L	1.12	15.9	11.3	U	1/11/2012	
Technetium-99	pCi/L	8.47	13.9	10.3	UM	4/16/2012	
Technetium-99	pCi/L	8.37	13.9	10.3	UM	4/16/2012	Duplicate
Technetium-99	pCi/L	4.98	16.6	11.4	U	7/9/2012	
Technetium-99	pCi/L	-1.09	16.5	10.8	U	10/3/2012	

KPDES Radiological Data

Table C.1.4. Radiological Effluent Data for Outfall 019

Analysis	Units	Result	MDA	TPU	Lab Qualifiers	Date Collected	
Alpha activity	pCi/L	1.22	4.96	0.685	U	10/16/2012	
Beta activity	pCi/L	4.64	5.77	0.953	U	10/16/2012	
Technetium-99	pCi/L	9.03	15.2	11.3	U	10/16/2012	

Table C.1.5. Radiological Effluent Data for Outfall 020

Analysis	Units	Result	MDA	TPU	Lab Qualifiers	Date Collected	
Alpha activity	pCi/L	13	9.38	4.97		1/4/2012	
Alpha activity	pCi/L	4.37	8.6	1.82	U	2/6/2012	
Alpha activity	pCi/L	1.95	6.52	1.08	U	3/5/2012	
Alpha activity	pCi/L	10.2	13.8	4.8	U	4/3/2012	
Alpha activity	pCi/L	12.2	17.1	5.97	U	5/3/2012	
Alpha activity	pCi/L	0.629	13.3	0.404	U	6/12/2012	
Alpha activity	pCi/L	4.28	14.8	2.41	U	7/11/2012	
Alpha activity	pCi/L	11.9	14.6	5.63	U	8/1/2012	
Alpha activity	pCi/L	-2.85	15.6	2.22	UX	9/6/2012	
Alpha activity	pCi/L	10.5	14	4.98	U	10/3/2012	
Alpha activity	pCi/L	10.1	12.8	4.68	U	11/7/2012	
Alpha activity	pCi/L	3.63	11.9	2.06	U	12/5/2012	Duplicate
Alpha activity	pCi/L	2.42	12	1.47	U	12/5/2012	
Beta activity	pCi/L	21.3	9.01	3.38		1/4/2012	
Beta activity	pCi/L	17.4	8.63	2.31		2/6/2012	
Beta activity	pCi/L	20	5.98	3.53	L	3/5/2012	
Beta activity	pCi/L	30.6	12.7	5.74		4/3/2012	
Beta activity	pCi/L	24.9	13.2	4.7		5/3/2012	
Beta activity	pCi/L	16.9	12.3	3.33		6/12/2012	
Beta activity	pCi/L	19.3	12.7	3.76		7/11/2012	
Beta activity	pCi/L	25.9	12.6	4.82		8/1/2012	
Beta activity	pCi/L	14.5	9.25	2.77		9/6/2012	
Beta activity	pCi/L	15.9	12.8	3.11		10/3/2012	
Beta activity	pCi/L	23.1	12.3	3.55		11/7/2012	
Beta activity	pCi/L	13.2	12.2	2.19		12/5/2012	Duplicate
Beta activity	pCi/L	7.91	12.2	1.38	U	12/5/2012	
Technetium-99	pCi/L	12.7	16.6	12.1	U	1/4/2012	
Technetium-99	pCi/L	18.2	15.5	11.6		4/3/2012	
Technetium-99	pCi/L	8.96	16.6	11.5	U	7/11/2012	Duplicate
Technetium-99	pCi/L	19.7	16.6	11.8		7/11/2012	
Technetium-99	pCi/L	4.8	16.5	11.7	U	10/3/2012	

Surface Water Radiological Data

Table C.1.6. Radiological Effluent Data for Landfill Surface Water Location L135

Upstream of the C-746-S&T Closed Landfills

Analysis	Units	Result	MDA	TPU	Lab Qualifiers	Date Collected
Alpha activity	pCi/L	2.77	3.94	1.4	U	2/29/2012
Alpha activity	pCi/L	2.99	3.89	1.45	U	11/12/2012
Beta activity	pCi/L	12.5	5.11	2.34		2/29/2012
Beta activity	pCi/L	35.2	5.5	5.18		11/12/2012

Table C.1.7. Radiological Effluent Data for Landfill Surface Water Location L136

At the C-746-S&T Closed Landfills

Analysis	Units	Result	MDA	TPU	Lab Qualifiers	Date Collected
Alpha activity	pCi/L	5.39	4.67	2.5		2/29/2012
Beta activity	pCi/L	9.1	5.41	1.81		2/29/2012

Table C.1.8. Radiological Effluent Data for Landfill Surface Water Location L150

At the C-746-U Landfill

Analysis	Units	Result	MDA	TPU	Lab Qualifiers	Date Collected	
Alpha activity	pCi/L	1.26	4.39	0.757	U	2/29/2012	
Alpha activity	pCi/L	6.06	4.64	2.86		11/12/2012	Duplicate
Alpha activity	pCi/L	-1.12	4.12	0.958	U	11/12/2012	
Beta activity	pCi/L	6.59	5.31	1.36		2/29/2012	
Beta activity	pCi/L	7.26	5.83	1.41		11/12/2012	Duplicate
Beta activity	pCi/L	11.2	5.61	2.04		11/12/2012	

Table C.1.9. Radiological Effluent Data for Landfill Surface Water Location L154

Upstream of the C-746-U Landfill

Analysis	Units	Result	MDA	TPU	Lab Qualifiers	Date Collected	
Alpha activity	pCi/L	4.33	3.92	1.98		2/29/2012	
Alpha activity	pCi/L	3.61	3.91	1.7	U	11/12/2012	Duplicate
Alpha activity	pCi/L	4.38	3.84	1.97		11/12/2012	
Beta activity	pCi/L	15.6	5.11	2.8		2/29/2012	
Beta activity	pCi/L	35	5.51	5.16		11/12/2012	Duplicate
Beta activity	pCi/L	41.1	5.48	5.86		11/12/2012	

Surface Water Radiological Data

Table C.1.10. Radiological Effluent Data for Landfill Surface Water Location L351

Downstream of the C-746-U Landfill

Analysis	Units	Result	MDA	TPU	Lab Qualifiers	Date Collected
Alpha activity	pCi/L	8.17	3.85	3.22		2/29/2012
Alpha activity	pCi/L	4.6	3.79	2.09		11/12/2012
Beta activity	pCi/L	17.9	5.08	3.12		2/29/2012
Beta activity	pCi/L	30.1	5.45	4.56		11/12/2012

C.2. RADIOLOGICAL ENVIRONMENTAL SURVEILLANCE DATA

Ambient Air Data

Table C.2.1. Radiological Data for Ambient Air Location AMD002

Analysis	Units	Result	MDA	TPU	Lab Qualifiers	Date Collected
Americium-241	pCi/sample	-0.0392	11		U	10/3/2012
Gross Alpha	pCi/sample	-1.39	2.59		U	7/9/2012
Gross Alpha	pCi/sample	-0.719	5.34		U	7/17/2012
Gross Alpha	pCi/sample	-0.173	4.38		U	7/26/2012
Gross Alpha	pCi/sample	-0.938	4.8		U	8/2/2012
Gross Alpha	pCi/sample	0.173	5.18		U	8/9/2012
Gross Alpha	pCi/sample	-2.65	5.84		U	8/16/2012
Gross Alpha	pCi/sample	-1.32	4.8		U	8/23/2012
Gross Alpha	pCi/sample	0.312	2.6		U	8/30/2012
Gross Alpha	pCi/sample	-0.684	3.31		U	9/6/2012
Gross Alpha	pCi/sample	0.123	3.31		U	9/13/2012
Gross Alpha	pCi/sample	0.826	3.25		U	9/19/2012
Gross Alpha	pCi/sample	1.76	3.25		U	9/27/2012
Gross Alpha	pCi/sample	0.11	3.25		U	10/4/2012
Gross Alpha	pCi/sample	0.245	3.25		U	10/11/2012
Gross Alpha	pCi/sample	-0.581	3.25		U	10/18/2012
Gross Alpha	pCi/sample	-0.4	3.25		U	10/25/2012
Gross Alpha	pCi/sample	-1.42	3.25		U	11/1/2012
Gross Alpha	pCi/sample	-0.655	3.25		U	11/8/2012
Gross Alpha	pCi/sample	1.51	3.25		U	11/15/2012
Gross Alpha	pCi/sample	-1.07	3.25		U	11/20/2012
Gross Alpha	pCi/sample	0.056	3.25		U	11/29/2012
Gross Alpha	pCi/sample	0.165	3.26		U	12/13/2012
Gross Alpha	pCi/sample	0.99	3.26		U	12/20/2012
Gross Alpha	pCi/sample	0.863	3.26		U	12/27/2012
Gross Beta	pCi/sample	34	5.6			7/9/2012
Gross Beta	pCi/sample	8.37	7.77			7/17/2012
Gross Beta	pCi/sample	7.57	8.57		U	7/26/2012
Gross Beta	pCi/sample	18.9	7.62			8/2/2012
Gross Beta	pCi/sample	20.6	7.92			8/9/2012
Gross Beta	pCi/sample	9.46	8.64			8/16/2012
Gross Beta	pCi/sample	17.2	8.13			8/23/2012
Gross Beta	pCi/sample	20.5	7.62			8/30/2012
Gross Beta	pCi/sample	11.1	6.39			9/6/2012
Gross Beta	pCi/sample	12.1	6.39			9/13/2012
Gross Beta	pCi/sample	15.7	6.44			9/19/2012
Gross Beta	pCi/sample	21.4	6.44			9/27/2012
Gross Beta	pCi/sample	21.4	6.44			10/4/2012
Gross Beta	pCi/sample	13.3	6.44			10/11/2012
Gross Beta	pCi/sample	16.9	6.44			10/18/2012
Gross Beta	pCi/sample	18.4	6.44			10/25/2012
Gross Beta	pCi/sample	12.5	6.44			11/1/2012
Gross Beta	pCi/sample	17.1	6.44			11/8/2012
Gross Beta	pCi/sample	16.9	6.44			11/15/2012
Gross Beta	pCi/sample	19.8	6.44			11/20/2012
Gross Beta	pCi/sample	39.6	6.44			11/29/2012

Ambient Air Data

Table C.2.1. Radiological Data for Ambient Air Location AMD002 (Continued)

Analysis	Units	Result	MDA	TPU	Lab Qualifiers	Date Collected
Gross Beta	pCi/sample	14.5	6.36			12/13/2012
Gross Beta	pCi/sample	19.8	6.36			12/20/2012
Gross Beta	pCi/sample	12.5	6.36			12/27/2012
Neptunium-237	pCi/sample	-0.75	5.2		U	10/3/2012
Plutonium-238	pCi/sample	-0.0153	0.443		UT	10/3/2012
Plutonium-239/240	pCi/sample	0.0089	0.212		UT	10/3/2012
Technetium-99	pCi/sample	1.3	5.38		U	10/3/2012
Thorium-234	pCi/sample	-2.22	57.2		U	10/3/2012
Uranium-234	pCi/sample	1.25	1.04		TX	10/3/2012
Uranium-235	pCi/sample	0.218	0.189		TX	10/3/2012
Uranium-238	pCi/sample	0.604	0.499		TX	10/3/2012
Total Flow	ft^3	32563				7/9/2012
Total Flow	ft^3	19769				8/9/2012
Total Flow	ft^3	20054				9/6/2012
Total Flow	ft^3	22187				7/17/2012
Total Flow	ft^3	20202				8/16/2012
Total Flow	ft^3	19798				9/13/2012
Total Flow	ft^3	19766				7/26/2012
Total Flow	ft^3	20156				8/23/2012
Total Flow	ft^3	17552				9/19/2012
Total Flow	ft^3	20212				8/2/2012
Total Flow	ft^3	20779				8/30/2012
Total Flow	ft^3	22607				9/27/2012

Table C.2.2. Radiological Data for Ambient Air Location AMD012

Analysis	Units	Result	MDA	TPU	Lab Qualifiers	Date Collected
Americium-241	pCi/sample	2.17	10.8		U	10/3/2012
Gross Alpha	pCi/sample	1.05	2.59		U	7/9/2012
Gross Alpha	pCi/sample	-2.56	5.34		U	7/17/2012
Gross Alpha	pCi/sample	-1.14	4.38		U	7/26/2012
Gross Alpha	pCi/sample	-2.66	4.8		U	8/2/2012
Gross Alpha	pCi/sample	-2.05	5.18		U	8/9/2012
Gross Alpha	pCi/sample	-4.11	5.84		U	8/16/2012
Gross Alpha	pCi/sample	-1.25	4.8		U	8/23/2012
Gross Alpha	pCi/sample	-0.382	2.6		U	8/30/2012
Gross Alpha	pCi/sample	-0.851	3.31		U	9/6/2012
Gross Alpha	pCi/sample	-0.404	3.31		U	9/13/2012
Gross Alpha	pCi/sample	0.589	3.25		U	9/19/2012
Gross Alpha	pCi/sample	-1.43	3.25		U	9/27/2012
Gross Alpha	pCi/sample	-0.149	3.25		U	10/4/2012
Gross Alpha	pCi/sample	-1.04	3.25		U	10/11/2012
Gross Alpha	pCi/sample	0.949	3.25		U	10/18/2012
Gross Alpha	pCi/sample	2.15	3.25		U	10/25/2012
Gross Alpha	pCi/sample	0.71	3.25		U	11/1/2012
Gross Alpha	pCi/sample	0.775	3.25		U	11/8/2012
Gross Alpha	pCi/sample	0.419	3.25		U	11/15/2012

Ambient Air Data

Table C.2.2. Radiological Data for Ambient Air Location AMD012 (Continued)

Analysis	Units	Result	MDA	TPU	Lab Qualifiers	Date Collected
Gross Alpha	pCi/sample	0.372	3.25		U	11/20/2012
Gross Alpha	pCi/sample	-0.689	3.25		U	11/29/2012
Gross Alpha	pCi/sample	-0.417	3.26		U	12/13/2012
Gross Alpha	pCi/sample	-0.667	3.26		U	12/20/2012
Gross Alpha	pCi/sample	1.28	3.26		U	12/27/2012
Gross Beta	pCi/sample	31.6	5.6			7/9/2012
Gross Beta	pCi/sample	12.2	7.77			7/17/2012
Gross Beta	pCi/sample	5.52	8.57		U	7/26/2012
Gross Beta	pCi/sample	20.5	7.62			8/2/2012
Gross Beta	pCi/sample	21.9	7.92			8/9/2012
Gross Beta	pCi/sample	15	8.64			8/16/2012
Gross Beta	pCi/sample	16.1	8.13			8/23/2012
Gross Beta	pCi/sample	22.9	7.62			8/30/2012
Gross Beta	pCi/sample	9.25	6.39			9/6/2012
Gross Beta	pCi/sample	15.6	6.39			9/13/2012
Gross Beta	pCi/sample	15.2	6.44			9/19/2012
Gross Beta	pCi/sample	21.1	6.44			9/27/2012
Gross Beta	pCi/sample	21.9	6.44			10/4/2012
Gross Beta	pCi/sample	17.1	6.44			10/11/2012
Gross Beta	pCi/sample	24.2	6.44			10/18/2012
Gross Beta	pCi/sample	15	6.44			10/25/2012
Gross Beta	pCi/sample	12.5	6.44			11/1/2012
Gross Beta	pCi/sample	14.2	6.44			11/8/2012
Gross Beta	pCi/sample	18.1	6.44			11/15/2012
Gross Beta	pCi/sample	16.9	6.44			11/20/2012
Gross Beta	pCi/sample	33.3	6.44			11/29/2012
Gross Beta	pCi/sample	15.8	6.36			12/13/2012
Gross Beta	pCi/sample	21.2	6.36			12/20/2012
Gross Beta	pCi/sample	16.1	6.36			12/27/2012
Neptunium-237	pCi/sample	-1.72	4.82		U	10/3/2012
Plutonium-238	pCi/sample	-0.0077	0.446		U	10/3/2012
Plutonium-239/240	pCi/sample	0.0118	0.218		U	10/3/2012
Technetium-99	pCi/sample	-1.17	5.38		U	10/3/2012
Thorium-234	pCi/sample	4.56	57.2		U	10/3/2012
Uranium-234	pCi/sample	3	1.04		TX	10/3/2012
Uranium-235	pCi/sample	0.593	0.179		TX	10/3/2012
Uranium-238	pCi/sample	1.98	0.493		TX	10/3/2012
Total Flow	ft^3	32540				7/9/2012
Total Flow	ft^3	19740				8/9/2012
Total Flow	ft^3	20031				9/6/2012
Total Flow	ft^3	22135				7/17/2012
Total Flow	ft^3	20210				8/16/2012
Total Flow	ft^3	19781				9/13/2012
Total Flow	ft^3	19768				7/26/2012
Total Flow	ft^3	20132				8/23/2012
Total Flow	ft^3	17508				9/19/2012
Total Flow	ft^3	20134				8/2/2012
Total Flow	ft^3	20757				8/30/2012
Total Flow	ft^3	22603				9/27/2012

Ambient Air Data

Table C.2.3. Radiological Data for Ambient Air Location AMD015

Analysis	Units	Result	MDA	TPU	Lab Qualifiers	Date Collected
Americium-241	pCi/sample	2.13	11.1		U	10/3/2012
Gross Alpha	pCi/sample	-0.0981	2.59		U	7/9/2012
Gross Alpha	pCi/sample	-2.52	5.34		U	7/17/2012
Gross Alpha	pCi/sample	-0.267	3.25		U	9/27/2012
Gross Alpha	pCi/sample	0.353	3.25		U	10/4/2012
Gross Alpha	pCi/sample	-0.279	3.25		U	10/11/2012
Gross Alpha	pCi/sample	0.029	3.25		U	10/18/2012
Gross Alpha	pCi/sample	1.26	3.25		U	10/25/2012
Gross Alpha	pCi/sample	-1.4	3.25		U	11/1/2012
Gross Alpha	pCi/sample	1.18	3.25		U	11/8/2012
Gross Alpha	pCi/sample	1.42	3.25		U	11/15/2012
Gross Alpha	pCi/sample	0.384	3.25		U	11/20/2012
Gross Alpha	pCi/sample	-0.624	3.25		U	11/29/2012
Gross Alpha	pCi/sample	0.735	3.26		U	12/13/2012
Gross Alpha	pCi/sample	0.621	3.26		U	12/20/2012
Gross Alpha	pCi/sample	-1.69	3.26		U	12/27/2012
Gross Beta	pCi/sample	28	5.6			7/9/2012
Gross Beta	pCi/sample	15.7	7.77			7/17/2012
Gross Beta	pCi/sample	18.7	6.44			9/27/2012
Gross Beta	pCi/sample	15.4	6.44			10/4/2012
Gross Beta	pCi/sample	13.1	6.44			10/11/2012
Gross Beta	pCi/sample	21.1	6.44			10/18/2012
Gross Beta	pCi/sample	11.4	6.44			10/25/2012
Gross Beta	pCi/sample	12	6.44			11/1/2012
Gross Beta	pCi/sample	10.1	6.44			11/8/2012
Gross Beta	pCi/sample	18.8	6.44			11/15/2012
Gross Beta	pCi/sample	16.6	6.44			11/20/2012
Gross Beta	pCi/sample	32	6.44			11/29/2012
Gross Beta	pCi/sample	13.6	6.36			12/13/2012
Gross Beta	pCi/sample	22.3	6.36			12/20/2012
Gross Beta	pCi/sample	17.4	6.36			12/27/2012
Neptunium-237	pCi/sample	-0.898	5.08		U	10/3/2012
Plutonium-238	pCi/sample	0.0336	0.446		UT	10/3/2012
Plutonium-239/240	pCi/sample	0.0274	0.214		UT	10/3/2012
Technetium-99	pCi/sample	-0.622	5.38		U	10/3/2012
Thorium-234	pCi/sample	47	34.6			10/3/2012
Uranium-234	pCi/sample	1.57	1.04		TX	10/3/2012
Uranium-235	pCi/sample	0.103	0.186		TUX	10/3/2012
Uranium-238	pCi/sample	0.775	0.497		TX	10/3/2012
Total Flow	ft^3	32499				7/9/2012
Total Flow	ft^3	22454				7/17/2012
Total Flow	ft^3	22378				9/27/2012

Ambient Air Data

Table C.2.4. Radiological Data for Ambient Air Location AMD57

Analysis	Units	Result	MDA	TPU	Lab Qualifiers	Date Collected
Americium-241	pCi/sample	5.75	11		U	10/3/2012
Gross Alpha	pCi/sample	0.618	2.59		U	7/9/2012
Gross Alpha	pCi/sample	-2.34	5.34		U	7/17/2012
Gross Alpha	pCi/sample	0.474	4.38		U	7/26/2012
Gross Alpha	pCi/sample	-0.807	4.8		U	8/2/2012
Gross Alpha	pCi/sample	-0.856	5.18		U	8/9/2012
Gross Alpha	pCi/sample	-0.825	5.84		U	8/16/2012
Gross Alpha	pCi/sample	-0.721	4.8		U	8/23/2012
Gross Alpha	pCi/sample	2.69	2.6			8/30/2012
Gross Alpha	pCi/sample	1.43	3.31		U	9/6/2012
Gross Alpha	pCi/sample	2.34	3.31		U	9/13/2012
Gross Alpha	pCi/sample	1.6	3.25		U	9/19/2012
Gross Alpha	pCi/sample	0.644	3.25		U	9/27/2012
Gross Alpha	pCi/sample	1.2	3.25		U	10/4/2012
Gross Alpha	pCi/sample	0.422	3.25		U	10/11/2012
Gross Alpha	pCi/sample	-0.0075	3.25		U	10/18/2012
Gross Alpha	pCi/sample	-0.724	3.25		U	10/25/2012
Gross Alpha	pCi/sample	0.345	3.25		U	11/1/2012
Gross Alpha	pCi/sample	0.231	3.25		U	11/8/2012
Gross Alpha	pCi/sample	-0.364	3.25		U	11/15/2012
Gross Alpha	pCi/sample	-0.696	3.25		U	11/20/2012
Gross Alpha	pCi/sample	-0.802	3.25		U	11/29/2012
Gross Alpha	pCi/sample	-0.521	3.26		U	12/13/2012
Gross Alpha	pCi/sample	-1.04	3.26		U	12/20/2012
Gross Alpha	pCi/sample	0.521	3.26		U	12/27/2012
Gross Beta	pCi/sample	32.1	5.6			7/9/2012
Gross Beta	pCi/sample	12.6	7.77			7/17/2012
Gross Beta	pCi/sample	10.4	8.57			7/26/2012
Gross Beta	pCi/sample	16.9	7.62			8/2/2012
Gross Beta	pCi/sample	19.4	7.92			8/9/2012
Gross Beta	pCi/sample	14.5	8.64			8/16/2012
Gross Beta	pCi/sample	16.2	8.13			8/23/2012
Gross Beta	pCi/sample	21.4	7.62			8/30/2012
Gross Beta	pCi/sample	7.2	6.39			9/6/2012
Gross Beta	pCi/sample	11.5	6.39			9/13/2012
Gross Beta	pCi/sample	11.7	6.44			9/19/2012
Gross Beta	pCi/sample	22.7	6.44			9/27/2012
Gross Beta	pCi/sample	22	6.44			10/4/2012
Gross Beta	pCi/sample	14.9	6.44			10/11/2012
Gross Beta	pCi/sample	21.9	6.44			10/18/2012
Gross Beta	pCi/sample	13.9	6.44			10/25/2012
Gross Beta	pCi/sample	14.7	6.44			11/1/2012
Gross Beta	pCi/sample	14.6	6.44			11/8/2012
Gross Beta	pCi/sample	17.7	6.44			11/15/2012
Gross Beta	pCi/sample	24.2	6.44			11/20/2012
Gross Beta	pCi/sample	30.3	6.44			11/29/2012
Gross Beta	pCi/sample	18.5	6.36			12/13/2012
Gross Beta	pCi/sample	17.2	6.36			12/20/2012
Gross Beta	pCi/sample	14.8	6.36			12/27/2012

Ambient Air Data

Table C.2.4. Radiological Data for Ambient Air Location AMD57 (Continued)

Analysis	Units	Result	MDA	TPU	Lab Qualifiers	Date Collected
Neptunium-237	pCi/sample	2.96	5.44		U	10/3/2012
Plutonium-238	pCi/sample	0.0013	0.447		U	10/3/2012
Plutonium-239/240	pCi/sample	0.32	0.219			10/3/2012
Technetium-99	pCi/sample	-0.751	5.38		U	10/3/2012
Thorium-234	pCi/sample	9.05	57.4		U	10/3/2012
Uranium-234	pCi/sample	4.06	1.05		TX	10/3/2012
Uranium-235	pCi/sample	0.448	0.187		TX	10/3/2012
Uranium-238	pCi/sample	1.16	0.495		TX	10/3/2012
Total Flow	ft^3	32464				7/9/2012
Total Flow	ft^3	19976				8/9/2012
Total Flow	ft^3	20029				9/6/2012
Total Flow	ft^3	22537				7/17/2012
Total Flow	ft^3	20167				8/16/2012
Total Flow	ft^3	19779				9/13/2012
Total Flow	ft^3	19764				7/26/2012
Total Flow	ft^3	20053				8/23/2012
Total Flow	ft^3	17487				9/19/2012
Total Flow	ft^3	19923				8/2/2012
Total Flow	ft^3	20826				8/30/2012
Total Flow	ft^3	22563				9/27/2012

Table C.2.5. Radiological Data for Ambient Air Location AMD612

Analysis	Units	Result	MDA	TPU	Lab Qualifiers	Date Collected
Americium-241	pCi/sample	-3.36	10.6		U	10/3/2012
Gross Alpha	pCi/sample	-1.08	2.59		U	7/9/2012
Gross Alpha	pCi/sample	-2.36	5.34		U	7/17/2012
Gross Alpha	pCi/sample	-0.404	4.8		U	8/2/2012
Gross Alpha	pCi/sample	-1.67	5.18		U	8/9/2012
Gross Alpha	pCi/sample	-3.62	5.84		U	8/16/2012
Gross Alpha	pCi/sample	0.16	4.8		U	8/23/2012
Gross Alpha	pCi/sample	0.301	2.6		U	8/30/2012
Gross Alpha	pCi/sample	0.853	3.31		U	9/6/2012
Gross Alpha	pCi/sample	-0.431	3.31		U	9/13/2012
Gross Alpha	pCi/sample	1.29	3.25		U	9/19/2012
Gross Alpha	pCi/sample	0.465	3.25		U	9/27/2012
Gross Alpha	pCi/sample	-0.236	3.25		U	10/4/2012
Gross Alpha	pCi/sample	0.973	3.25		U	10/11/2012
Gross Alpha	pCi/sample	-0.504	3.25		U	10/18/2012
Gross Alpha	pCi/sample	-0.998	3.25		U	10/25/2012
Gross Alpha	pCi/sample	-0.124	3.25		U	11/1/2012
Gross Alpha	pCi/sample	0.416	3.25		U	11/8/2012
Gross Alpha	pCi/sample	1.44	3.25		U	11/15/2012
Gross Alpha	pCi/sample	0.226	3.25		U	11/20/2012
Gross Alpha	pCi/sample	-0.0725	3.25		U	11/29/2012
Gross Alpha	pCi/sample	0.551	3.26		U	12/13/2012
Gross Alpha	pCi/sample	-0.718	3.26		U	12/20/2012

Ambient Air Data

Table C.2.5. Radiological Data for Ambient Air Location AMD612 (Continued)

Analysis	Units	Result	MDA	TPU	Lab Qualifiers	Date Collected
Gross Alpha	pCi/sample	-0.384	3.26		U	12/27/2012
Gross Beta	pCi/sample	33.3	5.6			7/9/2012
Gross Beta	pCi/sample	12.9	7.77			7/17/2012
Gross Beta	pCi/sample	10.6	7.62			8/2/2012
Gross Beta	pCi/sample	19.4	7.92			8/9/2012
Gross Beta	pCi/sample	12.2	8.64			8/16/2012
Gross Beta	pCi/sample	15.1	8.13			8/23/2012
Gross Beta	pCi/sample	20.6	7.62			8/30/2012
Gross Beta	pCi/sample	7.83	6.39			9/6/2012
Gross Beta	pCi/sample	12.2	6.39			9/13/2012
Gross Beta	pCi/sample	8.21	6.44			9/19/2012
Gross Beta	pCi/sample	20.4	6.44			9/27/2012
Gross Beta	pCi/sample	18.1	6.44			10/4/2012
Gross Beta	pCi/sample	14.6	6.44			10/11/2012
Gross Beta	pCi/sample	21.1	6.44			10/18/2012
Gross Beta	pCi/sample	14.1	6.44			10/25/2012
Gross Beta	pCi/sample	13.3	6.44			11/1/2012
Gross Beta	pCi/sample	16.9	6.44			11/8/2012
Gross Beta	pCi/sample	18.4	6.44			11/15/2012
Gross Beta	pCi/sample	20.9	6.44			11/20/2012
Gross Beta	pCi/sample	42.2	6.44			11/29/2012
Gross Beta	pCi/sample	18.3	6.36			12/13/2012
Gross Beta	pCi/sample	22.5	6.36			12/20/2012
Gross Beta	pCi/sample	18.2	6.36			12/27/2012
Neptunium-237	pCi/sample	3.63	5.23		U	10/3/2012
Plutonium-238	pCi/sample	-0.0077	0.447		U	10/3/2012
Plutonium-239/240	pCi/sample	-0.0139	0.217		U	10/3/2012
Technetium-99	pCi/sample	0.596	5.38		U	10/3/2012
Thorium-234	pCi/sample	-4.4	57		U	10/3/2012
Uranium-234	pCi/sample	1.15	1.04		TX	10/3/2012
Uranium-235	pCi/sample	0.177	0.186		TUX	10/3/2012
Uranium-238	pCi/sample	0.55	0.497		TX	10/3/2012
Total Flow	ft^3	32454				7/9/2012
Total Flow	ft^3	19754				8/9/2012
Total Flow	ft^3	20028				9/6/2012
Total Flow	ft^3	22412				7/17/2012
Total Flow	ft^3	20149				8/16/2012
Total Flow	ft^3	19760				9/13/2012
Total Flow	ft^3	20139				8/23/2012
Total Flow	ft^3	17555				9/19/2012
Total Flow	ft^3	68873				8/2/2012
Total Flow	ft^3	20760				8/30/2012
Total Flow	ft^3	22164				9/27/2012

Ambient Air Data

Table C.2.6. Radiological Data for Ambient Air Location AMD746S

Analysis	Units	Result	MDA	TPU	Lab Qualifiers	Date Collected
Americium-241	pCi/sample	5.62	11		U	10/3/2012
Gross Alpha	pCi/sample	-0.733	2.59		U	7/9/2012
Gross Alpha	pCi/sample	-2.87	5.34		U	7/17/2012
Gross Alpha	pCi/sample	-1.48	4.38		U	7/26/2012
Gross Alpha	pCi/sample	-0.949	4.8		U	8/2/2012
Gross Alpha	pCi/sample	-1.95	5.18		U	8/9/2012
Gross Alpha	pCi/sample	-2.04	5.84		U	8/16/2012
Gross Alpha	pCi/sample	-1.24	4.8		U	8/23/2012
Gross Alpha	pCi/sample	-0.0728	2.6		U	8/30/2012
Gross Alpha	pCi/sample	-0.799	3.31		U	9/6/2012
Gross Alpha	pCi/sample	1.21	3.31		U	9/13/2012
Gross Alpha	pCi/sample	-0.0229	3.25		U	9/19/2012
Gross Alpha	pCi/sample	0.545	3.25		U	9/27/2012
Gross Alpha	pCi/sample	-0.247	3.25		U	10/4/2012
Gross Alpha	pCi/sample	-0.3	3.25		U	10/11/2012
Gross Alpha	pCi/sample	-1.06	3.25		U	10/18/2012
Gross Alpha	pCi/sample	1.63	3.25		U	10/25/2012
Gross Alpha	pCi/sample	-0.475	3.25		U	11/1/2012
Gross Alpha	pCi/sample	1.19	3.25		U	11/8/2012
Gross Alpha	pCi/sample	1.3	3.25		U	11/15/2012
Gross Alpha	pCi/sample	0.73	3.25		U	11/20/2012
Gross Alpha	pCi/sample	0.918	3.25		U	11/29/2012
Gross Alpha	pCi/sample	-0.181	3.26		U	12/13/2012
Gross Alpha	pCi/sample	-0.516	3.26		U	12/20/2012
Gross Alpha	pCi/sample	-0.328	3.26		U	12/27/2012
Gross Beta	pCi/sample	32	5.6			7/9/2012
Gross Beta	pCi/sample	13.2	7.77			7/17/2012
Gross Beta	pCi/sample	6.78	8.57		U	7/26/2012
Gross Beta	pCi/sample	23.3	7.62			8/2/2012
Gross Beta	pCi/sample	13.6	7.92			8/9/2012
Gross Beta	pCi/sample	17.4	8.64			8/16/2012
Gross Beta	pCi/sample	20.3	8.13			8/23/2012
Gross Beta	pCi/sample	26.5	7.62			8/30/2012
Gross Beta	pCi/sample	8.31	6.39			9/6/2012
Gross Beta	pCi/sample	15.7	6.39			9/13/2012
Gross Beta	pCi/sample	16.5	6.44			9/19/2012
Gross Beta	pCi/sample	18.4	6.44			9/27/2012
Gross Beta	pCi/sample	18.4	6.44			10/4/2012
Gross Beta	pCi/sample	18.2	6.44			10/11/2012
Gross Beta	pCi/sample	21.5	6.44			10/18/2012
Gross Beta	pCi/sample	14.9	6.44			10/25/2012
Gross Beta	pCi/sample	9.16	6.44			11/1/2012
Gross Beta	pCi/sample	17.6	6.44			11/8/2012
Gross Beta	pCi/sample	16.3	6.44			11/15/2012
Gross Beta	pCi/sample	21.7	6.44			11/20/2012
Gross Beta	pCi/sample	33.1	6.44			11/29/2012
Gross Beta	pCi/sample	16.6	6.36			12/13/2012
Gross Beta	pCi/sample	24.1	6.36			12/20/2012
Gross Beta	pCi/sample	16.4	6.36			12/27/2012

Ambient Air Data

Table C.2.6. Radiological Data for Ambient Air Location AMD746S (Continued)

Analysis	Units	Result	MDA	TPU	Lab Qualifiers	Date Collected
Neptunium-237	pCi/sample	-3.61	4.52		U	10/3/2012
Plutonium-238	pCi/sample	0.0292	0.448		U	10/3/2012
Plutonium-239/240	pCi/sample	0.023	0.223		U	10/3/2012
Technetium-99	pCi/sample	0.0777	5.38		U	10/3/2012
Thorium-234	pCi/sample	73.9	35.1			10/3/2012
Uranium-234	pCi/sample	1.23	1.04		TX	10/3/2012
Uranium-235	pCi/sample	0.369	0.184		TX	10/3/2012
Uranium-238	pCi/sample	0.387	0.496		TUX	10/3/2012
Total Flow	ft^3	32214				7/9/2012
Total Flow	ft^3	20114				8/9/2012
Total Flow	ft^3	20106				9/6/2012
Total Flow	ft^3	22913				7/17/2012
Total Flow	ft^3	20039				8/16/2012
Total Flow	ft^3	20071				9/13/2012
Total Flow	ft^3	19711				7/26/2012
Total Flow	ft^3	20078				8/23/2012
Total Flow	ft^3	17271				9/19/2012
Total Flow	ft^3	19991				8/2/2012
Total Flow	ft^3	20669				8/30/2012
Total Flow	ft^3	39812				9/27/2012

Table C.2.7. Radiological Data for Ambient Air Location AMD746U

Analysis	Units	Result	MDA	TPU	Lab Qualifiers	Date Collected
Americium-241	pCi/sample	0.0717	11.7		U	10/3/2012
Gross Alpha	pCi/sample	-0.063	2.59		U	7/9/2012
Gross Alpha	pCi/sample	-3.24	5.34		U	7/17/2012
Gross Alpha	pCi/sample	1.26	4.38		U	7/26/2012
Gross Alpha	pCi/sample	-0.255	4.8		U	8/2/2012
Gross Alpha	pCi/sample	-0.8	5.18		U	8/9/2012
Gross Alpha	pCi/sample	-2.7	5.84		U	8/16/2012
Gross Alpha	pCi/sample	-1.85	4.8		U	8/23/2012
Gross Alpha	pCi/sample	1.9	2.6		U	8/30/2012
Gross Alpha	pCi/sample	-0.153	3.31		U	9/6/2012
Gross Alpha	pCi/sample	-0.547	3.31		U	9/13/2012
Gross Alpha	pCi/sample	-0.0733	3.25		U	9/19/2012
Gross Alpha	pCi/sample	-0.508	3.25		U	9/27/2012
Gross Alpha	pCi/sample	-0.179	3.25		U	10/4/2012
Gross Alpha	pCi/sample	0.233	3.25		U	10/11/2012
Gross Alpha	pCi/sample	-0.438	3.25		U	10/18/2012
Gross Alpha	pCi/sample	-0.037	3.25		U	10/25/2012
Gross Alpha	pCi/sample	-1.2	3.25		U	11/1/2012
Gross Alpha	pCi/sample	0.606	3.25		U	11/8/2012
Gross Alpha	pCi/sample	-0.348	3.25		U	11/15/2012
Gross Alpha	pCi/sample	-0.178	3.25		U	11/20/2012
Gross Alpha	pCi/sample	0.432	3.25		U	11/29/2012
Gross Alpha	pCi/sample	-0.169	3.26		U	12/13/2012

Ambient Air Data

Table C.2.7. Radiological Data for Ambient Air Location AMD746U (Continued)

Analysis	Units	Result	MDA	TPU	Lab Qualifiers	Date Collected
Gross Alpha	pCi/sample	-0.0758	3.26		U	12/20/2012
Gross Alpha	pCi/sample	-1.15	3.26		U	12/27/2012
Gross Beta	pCi/sample	34.5	5.6			7/9/2012
Gross Beta	pCi/sample	9.79	7.77			7/17/2012
Gross Beta	pCi/sample	1.58	8.57		U	7/26/2012
Gross Beta	pCi/sample	21	7.62			8/2/2012
Gross Beta	pCi/sample	12	7.92			8/9/2012
Gross Beta	pCi/sample	10.3	8.64			8/16/2012
Gross Beta	pCi/sample	17	8.13			8/23/2012
Gross Beta	pCi/sample	21.1	7.62			8/30/2012
Gross Beta	pCi/sample	6.41	6.39			9/6/2012
Gross Beta	pCi/sample	13.8	6.39			9/13/2012
Gross Beta	pCi/sample	13	6.44			9/19/2012
Gross Beta	pCi/sample	18.1	6.44			9/27/2012
Gross Beta	pCi/sample	22.6	6.44			10/4/2012
Gross Beta	pCi/sample	18.2	6.44			10/11/2012
Gross Beta	pCi/sample	19.6	6.44			10/18/2012
Gross Beta	pCi/sample	16.3	6.44			10/25/2012
Gross Beta	pCi/sample	13.4	6.44			11/1/2012
Gross Beta	pCi/sample	19.2	6.44			11/8/2012
Gross Beta	pCi/sample	17.4	6.44			11/15/2012
Gross Beta	pCi/sample	17.4	6.44			11/20/2012
Gross Beta	pCi/sample	26.9	6.44			11/29/2012
Gross Beta	pCi/sample	16.3	6.36			12/13/2012
Gross Beta	pCi/sample	19.8	6.36			12/20/2012
Gross Beta	pCi/sample	17.2	6.36			12/27/2012
Neptunium-237	pCi/sample	4.98	5.44		U	10/3/2012
Plutonium-238	pCi/sample	0.019	0.448		U	10/3/2012
Plutonium-239/240	pCi/sample	0.0485	0.221		U	10/3/2012
Technetium-99	pCi/sample	1.37	5.38		U	10/3/2012
Thorium-234	pCi/sample	0.212	57.2		U	10/3/2012
Uranium-234	pCi/sample	0.761	1.04		TUX	10/3/2012
Uranium-235	pCi/sample	0.262	0.183		TX	10/3/2012
Uranium-238	pCi/sample	0.62	0.496		TX	10/3/2012
Total Flow	ft^3	32175				7/9/2012
Total Flow	ft^3	20112				8/9/2012
Total Flow	ft^3	20062				9/6/2012
Total Flow	ft^3	22901				7/17/2012
Total Flow	ft^3	20050				8/16/2012
Total Flow	ft^3	20107				9/13/2012
Total Flow	ft^3	19720				7/26/2012
Total Flow	ft^3	20112				8/23/2012
Total Flow	ft^3	17222				9/19/2012
Total Flow	ft^3	19925				8/2/2012
Total Flow	ft^3	20712				8/30/2012
Total Flow	ft^3	22543				9/27/2012

Ambient Air Data

Table C.2.8. Radiological Data for Ambient Air Location AMDBCP

Analysis	Units	Result	MDA	TPU	Lab Qualifiers	Date Collected
Americium-241	pCi/sample	-0.845	10.4		U	10/3/2012
Gross Alpha	pCi/sample	0.798	2.59		U	7/9/2012
Gross Alpha	pCi/sample	-2.11	5.34		U	7/17/2012
Gross Alpha	pCi/sample	-0.416	4.38		U	7/26/2012
Gross Alpha	pCi/sample	-0.346	4.8		U	8/2/2012
Gross Alpha	pCi/sample	-1.67	5.18		U	8/9/2012
Gross Alpha	pCi/sample	-1.99	4.8		U	8/23/2012
Gross Alpha	pCi/sample	2.24	2.6		U	8/30/2012
Gross Alpha	pCi/sample	-0.45	3.31		U	9/6/2012
Gross Alpha	pCi/sample	0.773	3.31		U	9/13/2012
Gross Alpha	pCi/sample	-1.2	3.25		U	9/19/2012
Gross Alpha	pCi/sample	1.05	3.25		U	9/27/2012
Gross Alpha	pCi/sample	-1.01	3.25		U	10/4/2012
Gross Alpha	pCi/sample	0.607	3.25		U	10/11/2012
Gross Alpha	pCi/sample	0.569	3.25		U	10/18/2012
Gross Alpha	pCi/sample	1.02	3.25		U	10/25/2012
Gross Alpha	pCi/sample	1.01	3.25		U	11/1/2012
Gross Alpha	pCi/sample	-0.405	3.25		U	11/8/2012
Gross Alpha	pCi/sample	-0.417	3.25		U	11/15/2012
Gross Alpha	pCi/sample	-0.0697	3.25		U	11/20/2012
Gross Alpha	pCi/sample	0.143	3.25		U	11/29/2012
Gross Alpha	pCi/sample	1.25	3.26		U	12/13/2012
Gross Alpha	pCi/sample	-0.0758	3.26		U	12/20/2012
Gross Alpha	pCi/sample	-0.414	3.26		U	12/27/2012
Gross Beta	pCi/sample	31.3	5.6			7/9/2012
Gross Beta	pCi/sample	14.2	7.77			7/17/2012
Gross Beta	pCi/sample	7.09	8.57		U	7/26/2012
Gross Beta	pCi/sample	22.4	7.62			8/2/2012
Gross Beta	pCi/sample	19.4	7.92			8/9/2012
Gross Beta	pCi/sample	14.8	8.13			8/23/2012
Gross Beta	pCi/sample	28.5	7.62			8/30/2012
Gross Beta	pCi/sample	6.89	6.39			9/6/2012
Gross Beta	pCi/sample	14.3	6.39			9/13/2012
Gross Beta	pCi/sample	13.9	6.44			9/19/2012
Gross Beta	pCi/sample	19.2	6.44			9/27/2012
Gross Beta	pCi/sample	23.5	6.44			10/4/2012
Gross Beta	pCi/sample	16.3	6.44			10/11/2012
Gross Beta	pCi/sample	20.9	6.44			10/18/2012
Gross Beta	pCi/sample	16.5	6.44			10/25/2012
Gross Beta	pCi/sample	11.7	6.44			11/1/2012
Gross Beta	pCi/sample	17.6	6.44			11/8/2012
Gross Beta	pCi/sample	18.8	6.44			11/15/2012
Gross Beta	pCi/sample	21.7	6.44			11/20/2012
Gross Beta	pCi/sample	32.7	6.44			11/29/2012
Gross Beta	pCi/sample	14.1	6.36			12/13/2012
Gross Beta	pCi/sample	19.8	6.36			12/20/2012
Gross Beta	pCi/sample	19.1	6.36			12/27/2012
Neptunium-237	pCi/sample	-0.271	5.14		U	10/3/2012
Plutonium-238	pCi/sample	0.0007	0.446		U	10/3/2012

Ambient Air Data

Table C.2.8. Radiological Data for Ambient Air Location AMDBCP (Continued)

Analysis	Units	Result	MDA	TPU	Lab Qualifiers	Date Collected
Plutonium-239/240	pCi/sample	0.0535	0.214		U	10/3/2012
Technetium-99	pCi/sample	-1.63	5.38		U	10/3/2012
Thorium-234	pCi/sample	-19.7	56.1		U	10/3/2012
Uranium-234	pCi/sample	0.42	1.07		TUX	10/3/2012
Uranium-235	pCi/sample	0.227	0.448		TUX	10/3/2012
Uranium-238	pCi/sample	0.225	0.588		TUX	10/3/2012
Total Flow	ft^3	32189				7/9/2012
Total Flow	ft^3	19966				8/9/2012
Total Flow	ft^3	19952				9/6/2012
Total Flow	ft^3	22685				7/17/2012
Total Flow	ft^3	20068				9/13/2012
Total Flow	ft^3	19921				7/26/2012
Total Flow	ft^3	20122				8/23/2012
Total Flow	ft^3	17251				9/19/2012
Total Flow	ft^3	19779				8/2/2012
Total Flow	ft^3	20828				8/30/2012
Total Flow	ft^3	22566				9/27/2012

Table C.2.9. Radiological Data for Ambient Air Location AMDNE

Analysis	Units	Result	MDA	TPU	Lab Qualifiers	Date Collected
Americium-241	pCi/sample	-3.18	10.8		U	10/3/2012
Gross Alpha	pCi/sample	0.355	2.59		U	7/9/2012
Gross Alpha	pCi/sample	-0.87	5.34		U	7/17/2012
Gross Alpha	pCi/sample	-0.388	4.38		U	7/26/2012
Gross Alpha	pCi/sample	-1.63	4.8		U	8/2/2012
Gross Alpha	pCi/sample	-0.376	5.18		U	8/9/2012
Gross Alpha	pCi/sample	-3.92	5.84		U	8/16/2012
Gross Alpha	pCi/sample	-1.82	4.8		U	8/23/2012
Gross Alpha	pCi/sample	-0.324	2.6		U	8/30/2012
Gross Alpha	pCi/sample	-0.747	3.31		U	9/6/2012
Gross Alpha	pCi/sample	1.22	3.31		U	9/13/2012
Gross Alpha	pCi/sample	-1.37	3.25		U	9/19/2012
Gross Alpha	pCi/sample	-0.279	3.25		U	9/27/2012
Gross Alpha	pCi/sample	-0.343	3.25		U	10/4/2012
Gross Alpha	pCi/sample	-0.201	3.25		U	10/11/2012
Gross Alpha	pCi/sample	-1.22	3.25		U	10/18/2012
Gross Alpha	pCi/sample	1.47	3.25		U	10/25/2012
Gross Alpha	pCi/sample	0.24	3.25		U	11/1/2012
Gross Alpha	pCi/sample	0.911	3.25		U	11/8/2012
Gross Alpha	pCi/sample	0.0767	3.25		U	11/15/2012
Gross Alpha	pCi/sample	-0.556	3.25		U	11/20/2012
Gross Alpha	pCi/sample	0.119	3.25		U	11/29/2012
Gross Alpha	pCi/sample	-0.169	3.26		U	12/13/2012
Gross Alpha	pCi/sample	1.3	3.26		U	12/20/2012
Gross Alpha	pCi/sample	0.345	3.26		U	12/27/2012

Ambient Air Data

Table C.2.9. Radiological Data for Ambient Air Location AMDNE (Continued)

Analysis	Units	Result	MDA	TPU	Lab Qualifiers	Date Collected
Gross Beta	pCi/sample	29.6	5.6			7/9/2012
Gross Beta	pCi/sample	11	7.77			7/17/2012
Gross Beta	pCi/sample	6.62	8.57		U	7/26/2012
Gross Beta	pCi/sample	17	7.62			8/2/2012
Gross Beta	pCi/sample	14.7	7.92			8/9/2012
Gross Beta	pCi/sample	11.7	8.64			8/16/2012
Gross Beta	pCi/sample	16.6	8.13			8/23/2012
Gross Beta	pCi/sample	26.2	7.62			8/30/2012
Gross Beta	pCi/sample	7.36	6.39			9/6/2012
Gross Beta	pCi/sample	11.9	6.39			9/13/2012
Gross Beta	pCi/sample	12.3	6.44			9/19/2012
Gross Beta	pCi/sample	19	6.44			9/27/2012
Gross Beta	pCi/sample	20.7	6.44			10/4/2012
Gross Beta	pCi/sample	16.5	6.44			10/11/2012
Gross Beta	pCi/sample	19.3	6.44			10/18/2012
Gross Beta	pCi/sample	12.5	6.44			10/25/2012
Gross Beta	pCi/sample	11.1	6.44			11/1/2012
Gross Beta	pCi/sample	18.1	6.44			11/8/2012
Gross Beta	pCi/sample	18.5	6.44			11/15/2012
Gross Beta	pCi/sample	20.4	6.44			11/20/2012
Gross Beta	pCi/sample	33.1	6.44			11/29/2012
Gross Beta	pCi/sample	16.3	6.36			12/13/2012
Gross Beta	pCi/sample	18.8	6.36			12/20/2012
Gross Beta	pCi/sample	20.4	6.36			12/27/2012
Neptunium-237	pCi/sample	1.6	5		U	10/3/2012
Plutonium-238	pCi/sample	0.0007	0.447		TU	10/3/2012
Plutonium-239/240	pCi/sample	0.0029	0.216		TU	10/3/2012
Technetium-99	pCi/sample	-0.777	5.38		U	10/3/2012
Thorium-234	pCi/sample	-24.9	55.7		U	10/3/2012
Uranium-234	pCi/sample	0.64	1.04		TUX	10/3/2012
Uranium-235	pCi/sample	0.367	0.182		TUX	10/3/2012
Uranium-238	pCi/sample	0.598	0.496		TUX	10/3/2012
Total Flow	ft^3	28782				7/9/2012
Total Flow	ft^3	19960				8/9/2012
Total Flow	ft^3	20140				9/6/2012
Total Flow	ft^3	22907				7/17/2012
Total Flow	ft^3	20257				8/16/2012
Total Flow	ft^3	20026				9/13/2012
Total Flow	ft^3	19621				7/26/2012
Total Flow	ft^3	20114				8/23/2012
Total Flow	ft^3	17314				9/19/2012
Total Flow	ft^3	19979				8/2/2012
Total Flow	ft^3	20621				8/30/2012
Total Flow	ft^3	22530				9/27/2012

Table C.2.10. Kentucky Radiation Health Branch Ambient Air Monitoring Results CY 2012

Quarter 1: Dates 1/5/2012 **thru** 3/29/2012

Nuclide	40CFR61 Table 2 Limit (Ci/m³)	AMSW017	AMW015	AMNW001	AMNE	AME002	AME012	AMBKG2	AMBOLD	AMKOW	AMMWNE
Volume (m³)=		1608.866449	1621.129118	1626.144978	1630.153924	1616.835478	1626.727411	1651.072518	1623.44	1628.82755	1621.667573
		Activity (pCi/sample)	Activity (pCi/sample)	Activity (pCi/sample)	Activity (pCi/sample)	Activity (pCi/sample)	Activity (pCi/sample)	Activity (pCi/sample)	Activity (pCi/sample)	Activity (pCi/sample)	Activity (pCi/sample)
		Concentration (Ci/m³)	Concentration (Ci/m³)	Concentration (Ci/m³)	Concentration (Ci/m³)	Concentration (Ci/m³)	Concentration (Ci/m³)	Concentration (Ci/m³)	Concentration (Ci/m³)	Concentration (Ci/m³)	Concentration (Ci/m³)
Am-241		-1.712033528	-1.576706569	0.104272545	-0.065498461	-4.548923929	-0.672610641	-0.072966469	-1.330810771	-1.545193359	-3.05688822
	1.90E-15	-1.06412E-15	-9.72598E-16	6.41225E-17	-4.01793E-17	-2.81347E-15	-4.13475E-16	-4.41934E-17	-8.19747E-16	-9.48654E-16	-1.88503E-15
Np-237		0.660220797	-0.295997578	0.970592024	-0.409144868	-0.642638319	-0.210514253	0.794327237	-0.068923975	-0.138392452	0.197831997
	1.20E-15	4.10364E-16	-1.82587E-16	5.96867E-16	-2.50985E-16	-3.97467E-16	-1.2941E-16	4.81098E-16	-4.24555E-17	-8.49645E-17	1.21993E-16
Tc-99		-0.004603055	0.289992938	0.216344718	0.220947652	0.220946502	0.101267269	0.243962817	0.08285517	0.013809174	0.050633639
	1.40E-13	-2.86105E-18	1.78883E-16	1.33041E-16	1.35538E-16	1.36654E-16	6.22521E-17	1.4776E-16	5.10368E-17	8.47798E-18	3.12232E-17
U-238/		0.005074332	0.00715612	0.059804234	0.009919457	0.051087755	0.007623281	0.003275294	0.058913464	0.018933526	0.051163936
Th-234	8.30E-15	3.15E-18	4.41E-18	3.68E-17	6.08E-18	3.16E-17	4.69E-18	1.98E-18	3.63E-17	1.16E-17	3.16E-17

Quarter 2: Dates 3/29/2012 **thru** 6/21/2012

Nuclide	40CFR61 Table 2 Limit (Ci/m³)	AMSW017	AMW015	AMNW001	AMNE	AME002	AME012	AMBKG2	AMBOLD	AMKOW	AMMWNE
Volume (m³)=		1335.020104	1567.125681	1570.942407	1568.215192	1569.059341	1562.58221	1587.7794	1444.038672	1389.333038	1559.730741
		Activity (pCi/sample)	Activity (pCi/sample)	Activity (pCi/sample)	Activity (pCi/sample)	Activity (pCi/sample)	Activity (pCi/sample)	Activity (pCi/sample)	Activity (pCi/sample)	Activity (pCi/sample)	Activity (pCi/sample)
		Concentration (Ci/m³)	Concentration (Ci/m³)	Concentration (Ci/m³)	Concentration (Ci/m³)	Concentration (Ci/m³)	Concentration (Ci/m³)	Concentration (Ci/m³)	Concentration (Ci/m³)	Concentration (Ci/m³)	Concentration (Ci/m³)
Am-241		-1.7910588	-0.2565742	0.0036069	-1.390376	-1.9008151	-0.0250528	-3.6713153	-1.3759681	-1.7929264	0.0272006
	1.90E-15	-1.34E-15	-1.64E-16	2.30E-18	-8.87E-16	-1.21E-15	-1.60E-17	-2.31E-15	-9.53E-16	-1.29E-15	1.74E-17
Np-237		-0.5289358	0.1183074	0.4944184	-0.7550768	-0.3713491	0.9126017	-0.0214267	-0.5266597	-0.2535121	-0.1331694
	1.20E-15	-3.96E-16	7.55E-17	3.15E-16	-4.81E-16	-2.37E-16	5.84E-16	-1.35E-17	-3.65E-16	-1.82E-16	-8.54E-17
Tc-99		-0.2788132	-0.1005553	-0.3839401	0.0319949	-0.4387878	0.0182829	-0.38851	-0.4342169	-0.2970967	-0.0959849
	1.40E-13	-2.09E-16	-6.42E-17	-2.44E-16	2.04E-17	-2.80E-16	1.17E-17	-2.45E-16	-3.01E-16	-2.14E-16	-6.15E-17
U-238/		0.0867717	0.1077092	0.1049401	0.1464707	0.0167985	0.0805545	0.0616952	0.182325	0.1621979	0.1056416
Th-234	8.30E-15	6.50E-17	6.87E-17	6.68E-17	9.34E-17	1.07E-17	5.16E-17	3.89E-17	1.26E-16	1.17E-16	6.77E-17

Table C.2.10. Kentucky Radiation Health Branch Ambient Air Monitoring Results CY 2012 (Continued)

Quarter 3: Dates 6/21/2012 **thru** 10/2/2012

Nuclide	40CFR61 Table 2 Limit (Ci/m^3)	AMSW017	AMW015	AMNW001	AMNE	AME002	AME012	AMBKG-2	AMBOLD	AMKOW	AMMWNE
Volume (m^3)=		1892.137947	1887.794996	1891.950691	1889.086656	1892.097301	1798.890761	1872.390707	1879.097933	1928.261424	1891.205854
		Activity (pCi/sample) / Concentration (Ci/m^3)	Activity (pCi/sample) / Concentration (Ci/m^3)	Activity (pCi/sample) / Concentration (Ci/m^3)	Activity (pCi/sample) / Concentration (Ci/m^3)	Activity (pCi/sample) / Concentration (Ci/m^3)	Activity (pCi/sample) / Concentration (Ci/m^3)	Activity (pCi/sample) / Concentration (Ci/m^3)	Activity (pCi/sample) / Concentration (Ci/m^3)	Activity (pCi/sample) / Concentration (Ci/m^3)	Activity (pCi/sample) / Concentration (Ci/m^3)
Am-241		-1.6125291	-0.0295612	-1.7377881	-0.0264867	-1.4096088	0.1362075	-3.7432751	-0.1149056	-1.9703395	-1.6578209
	1.90E-15	-8.52E-16	-1.57E-17	-9.19E-16	-1.40E-17	-7.45E-16	7.57E-17	-2.00E-15	-6.11E-17	-1.02E-15	-8.77E-16
Np-237		-0.1275312	0.1865822	0.5869733	0.3862715	0.0296346	-0.1918515	0.3574375	-0.4670681	0.4082703	-0.1596228
	1.20E-15	-6.74E-17	9.88E-17	3.10E-16	2.04E-16	1.57E-17	-1.07E-16	1.91E-16	-2.49E-16	2.12E-16	-8.44E-17
Tc-99		0.1656955	0.0301266	0.3816022	0.5523178	0.7832873	0.4368341	0.4418552	0.1205058	0.542277	0.1004214
	1.40E-13	8.76E-17	1.60E-17	2.02E-16	2.92E-16	4.14E-16	2.43E-16	2.36E-16	6.41E-17	2.81E-16	5.31E-17
U-238/		0.0409759	0.0047606	0.0754849	0.0455487	0.0768193	-0.0142176	-0.005921	0.0456218	0.0217356	0.0329242
Th-234	8.30E-15	2.17E-17	2.52E-18	3.99E-17	2.41E-17	4.06E-17	-7.90E-18	-3.16E-18	2.43E-17	1.13E-17	1.74E-17

Quarter 4: Dates 10/2/2012 **thru** 12/28/2012

Nuclide	40CFR61 Table 2 Limit (Ci/m^3)	AMSW017	AMW015	AMNW001	AMNE	AME002	AME012	AMBKG-2	AMBOLD	AMKOW	AMMWNE
Volume (m^3)=		1583.919376	1593.863555	1594.201258	1583.418775	1588.731744	1560.74846	1545.141386	1587.941672	1586.888233	1588.67911
		Activity (pCi/sample) / Concentration (Ci/m^3)	Activity (pCi/sample) / Concentration (Ci/m^3)	Activity (pCi/sample) / Concentration (Ci/m^3)	Activity (pCi/sample) / Concentration (Ci/m^3)	Activity (pCi/sample) / Concentration (Ci/m^3)	Activity (pCi/sample) / Concentration (Ci/m^3)	Activity (pCi/sample) / Concentration (Ci/m^3)	Activity (pCi/sample) / Concentration (Ci/m^3)	Activity (pCi/sample) / Concentration (Ci/m^3)	Activity (pCi/sample) / Concentration (Ci/m^3)
Am-241		-3.6405041	-0.055056	-2.5571114	-1.6073611	-1.6603988	-1.8224163	0.1259404	-0.1646338	-2.2733748	-1.6487512
	1.90E-15	-2.30E-15	-3.45E-17	-1.60E-15	-1.02E-15	-1.05E-15	-1.17E-15	8.15E-17	-1.04E-16	-1.43E-15	-1.04E-15
Np-237		-0.0003479	-0.2405959	-0.4705639	0.2323977	0.4607402	0.7534241	-0.0109202	0.1877716	-0.3855334	-0.1543488
	1.20E-15	-2.20E-19	-1.51E-16	-2.95E-16	1.47E-16	2.90E-16	4.83E-16	-7.07E-18	1.18E-16	-2.43E-16	-9.72E-17
Tc-99		0.7710368	1.0988458	0.8495266	0.6140591	1.0757596	1.0665234	0.9049306	0.6094432	0.9187798	1.001886
	1.40E-13	4.87E-16	6.89E-16	5.33E-16	3.88E-16	6.77E-16	6.83E-16	5.86E-16	3.84E-16	5.79E-16	6.31E-16
U-238/		0.0505343	0.0307005	0.0967576	0.0859817	0.2110248	0.1183426	0.0203999	0.1618067	0.1497122	0.0672231
Th-234	8.30E-15	3.19E-17	1.93E-17	6.07E-17	5.43E-17	1.33E-16	7.58E-17	1.32E-17	1.02E-16	9.43E-17	4.23E-17

Direct Gamma Radiation (TLD) Data

Table C.2.11. Radiological Exposure Due to Gamma Radiation (mrem)

Equivalent Dose to the Whole Body

Location Number	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annualized	Net Annualized
TLD-1	234	282	216	216	920	833
TLD-2	337	415	290	311	1313	1226
TLD-3	79	56	37	30	196	109
TLD-4	21	22	24	20	84	-3
TLD-5	35	25	30	21	108	21
TLD-6	18	24	23	20	83	-4
TLD-7	27	30	31	29	114	27
TLD-8	19	20	21	16	74	-13
TLD-9	20	23	23	18	82	-5
TLD-10	19	22	23	18	80	-7
TLD-11	21	24	24	20	86	-1
TLD-12	22	23	21	18	82	-5
TLD-13	28	25	25	19	94	7
TLD-14	21	21	22	20	82	-5
TLD-15	17	20	19	17	71	-16
TLD-16	25	23	24	21	90	3
TLD-17	21	20	22	18	79	-8
TLD-18	24	21	22	19	83	-4
TLD-19	23	23	23	20	86	-1
TLD-20	23	23	23	20	86	-1
TLD-22	26	23	23	21	90	3
TLD-23	24	23	22	21	87	0
TLD-25	30	24	28	31	110	23
TLD-26	19	21	21	22	81	-6
TLD-27	25	21	23	20	86	-1
TLD-28	20	22	23	18	81	-6
TLD-29	21	22	21	18	80	-7
TLD-30	20	21	23	19	81	-6
TLD-31	24	27	25	21	94	7
TLD-32	26	26	28	22	99	12
TLD-35	26	29	27	24	103	16
TLD-36	18	19	19	18	72	-15
TLD-37	19	22	24	19	82	-5
TLD-38	22	25	24	18	86	-1
TLD-39	20	20	22	18	78	-9
TLD-40	28	31	28	23	107	20
TLD-41	17	21	22	16	74	-13
TLD-46	19	21	22	19	79	-8
TLD-47	94	89	83	78	334	247
TLD-48	62	38	28	25	149	62
TLD-49	20	20	22	17	77	-10
TLD-50	44	48	47	41	175	88
TLD-51	24	27	27	24	99	12
TLD-52	29	35	30	31	121	34
TLD-53	131	130	92	111	450	363
TLD-54	21	23	26	23	90	3

C.3. NONRADIOLOGICAL EFFLUENT DATA

KPDES Outfall Nonradiological Data

Table C.3.1. Nonradiological Effluent Data for Outfall 001

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
Chlorine, Total Residual	mg/L	0.03		<	1/3/2012	
Chlorine, Total Residual	mg/L	0.03		<	1/9/2012	
Chlorine, Total Residual	mg/L	0.03		<	1/17/2012	
Chlorine, Total Residual	mg/L	0.03		<	1/23/2012	
Chlorine, Total Residual	mg/L	0.03		<	1/30/2012	
Chlorine, Total Residual	mg/L	0.03		<	2/6/2012	
Chlorine, Total Residual	mg/L	0.03		<	2/13/2012	
Chlorine, Total Residual	mg/L	0.03		<	2/20/2012	
Chlorine, Total Residual	mg/L	0.03		<	2/27/2012	
Chlorine, Total Residual	mg/L	0.03		<	3/5/2012	
Chlorine, Total Residual	mg/L	0.03		<	3/12/2012	
Chlorine, Total Residual	mg/L	0.03		<	3/19/2012	
Chlorine, Total Residual	mg/L	0.03		<	3/26/2012	
Chlorine, Total Residual	mg/L	0.03		<	4/3/2012	
Chlorine, Total Residual	mg/L	0.03		<	4/9/2012	
Chlorine, Total Residual	mg/L	0.03		<	4/16/2012	
Chlorine, Total Residual	mg/L	0.03		<	4/24/2012	
Chlorine, Total Residual	mg/L	0.03		<	5/1/2012	
Chlorine, Total Residual	mg/L	0.03		<	5/7/2012	
Chlorine, Total Residual	mg/L	0.03		<	5/14/2012	
Chlorine, Total Residual	mg/L	0.03		<	5/21/2012	
Chlorine, Total Residual	mg/L	0.03		<	5/29/2012	
Chlorine, Total Residual	mg/L	0.03		<	6/4/2012	
Chlorine, Total Residual	mg/L	0.03		<	6/11/2012	
Chlorine, Total Residual	mg/L	0.03		<	6/18/2012	
Chlorine, Total Residual	mg/L	0.03		<	6/25/2012	
Chlorine, Total Residual	mg/L	0.03		<	7/2/2012	
Chlorine, Total Residual	mg/L	0.03		<	7/9/2012	
Chlorine, Total Residual	mg/L	0.03		<	7/16/2012	
Chlorine, Total Residual	mg/L	0.03		<	7/23/2012	
Chlorine, Total Residual	mg/L	0.03		<	7/30/2012	
Chlorine, Total Residual	mg/L	0.03		<	8/6/2012	
Chlorine, Total Residual	mg/L	0.03		<	8/13/2012	
Chlorine, Total Residual	mg/L	0.03		<	8/20/2012	
Chlorine, Total Residual	mg/L	0.03		<	8/27/2012	
Chlorine, Total Residual	mg/L	0.03		<	9/4/2012	
Chlorine, Total Residual	mg/L	0.03		<	9/10/2012	
Chlorine, Total Residual	mg/L	0.03		<	9/17/2012	
Chlorine, Total Residual	mg/L	0.03		<	9/24/2012	
Chlorine, Total Residual	mg/L	0.03		<	10/1/2012	
Chlorine, Total Residual	mg/L	0.03		<	10/8/2012	
Chlorine, Total Residual	mg/L	0.03		<	10/15/2012	
Chlorine, Total Residual	mg/L	0.03		<	10/22/2012	
Chlorine, Total Residual	mg/L	0.03		<	10/29/2012	
Chlorine, Total Residual	mg/L	0.03		<	11/5/2012	
Chlorine, Total Residual	mg/L	0.03		<	11/13/2012	Duplicate

KPDES Outfall Nonradiological Data

Table C.3.1. Nonradiological Effluent Data for Outfall 001 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
Chlorine, Total Residual	mg/L	0.03		<	11/13/2012	
Chlorine, Total Residual	mg/L	0.03		<	11/19/2012	
Chlorine, Total Residual	mg/L	0.03		<	11/26/2012	
Chlorine, Total Residual	mg/L	0.03		<	12/3/2012	
Chlorine, Total Residual	mg/L	0.03		<	12/10/2012	
Chlorine, Total Residual	mg/L	0.03		<	12/17/2012	
Chlorine, Total Residual	mg/L	0.03		<	12/27/2012	
Conductivity	µmho/cm	1259			1/3/2012	
Conductivity	µmho/cm	1416			1/9/2012	
Conductivity	µmho/cm	770			1/11/2012	
Conductivity	µmho/cm	1236			1/13/2012	
Conductivity	µmho/cm	1273			1/17/2012	
Conductivity	µmho/cm	938			1/23/2012	
Conductivity	µmho/cm	1177			1/30/2012	
Conductivity	µmho/cm	755			2/6/2012	
Conductivity	µmho/cm	1158			2/13/2012	
Conductivity	µmho/cm	1073			2/20/2012	
Conductivity	µmho/cm	1269			2/27/2012	
Conductivity	µmho/cm	1260			3/5/2012	
Conductivity	µmho/cm	1248			3/12/2012	
Conductivity	µmho/cm	1163			3/19/2012	
Conductivity	µmho/cm	1218			3/26/2012	
Conductivity	µmho/cm	1406			4/3/2012	
Conductivity	µmho/cm	1317			4/9/2012	
Conductivity	µmho/cm	155			4/24/2012	
Conductivity	µmho/cm	153			5/2/2012	
Conductivity	µmho/cm	2.33			5/21/2012	
Cyanide	mg/L	0.005	0.005	U	1/3/2012	
Cyanide	mg/L	0.005	0.005	U	4/3/2012	
Cyanide	mg/L	0.005	0.005	U	7/2/2012	
Cyanide	mg/L	0.005	0.005	U	7/2/2012	Duplicate
Cyanide	mg/L	0.005	0.005	U	10/1/2012	
Dissolved Oxygen	mg/L	9.61			1/3/2012	
Dissolved Oxygen	mg/L	9.72			1/9/2012	
Dissolved Oxygen	mg/L	23.9			1/11/2012	
Dissolved Oxygen	mg/L	9.45			1/13/2012	
Dissolved Oxygen	mg/L	14.52			1/17/2012	
Dissolved Oxygen	mg/L	12.9			1/23/2012	
Dissolved Oxygen	mg/L	12.1			1/30/2012	
Dissolved Oxygen	mg/L	12.51			2/6/2012	
Dissolved Oxygen	mg/L	10.76			2/13/2012	
Dissolved Oxygen	mg/L	11.01			2/20/2012	
Dissolved Oxygen	mg/L	10.3			2/27/2012	
Dissolved Oxygen	mg/L	9.11			3/5/2012	
Dissolved Oxygen	mg/L	10.78			3/12/2012	
Dissolved Oxygen	mg/L	7.76			3/19/2012	
Dissolved Oxygen	mg/L	8.32			3/26/2012	
Dissolved Oxygen	mg/L	9.35			4/3/2012	
Dissolved Oxygen	mg/L	9.34			4/9/2012	

KPDES Outfall Nonradiological Data

Table C.3.1. Nonradiological Effluent Data for Outfall 001 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
Dissolved Oxygen	mg/L	8.88			4/24/2012
Dissolved Oxygen	mg/L	9.17			5/2/2012
Flow Rate	mgd	1.98			1/3/2012
Flow Rate	mgd	1.78			1/9/2012
Flow Rate	mgd	7.37			1/11/2012
Flow Rate	mgd	2.19			1/13/2012
Flow Rate	mgd	2.21			1/17/2012
Flow Rate	mgd	4.56			1/23/2012
Flow Rate	mgd	2.19			1/30/2012
Flow Rate	mgd	1.49			2/6/2012
Flow Rate	mgd	2.14			2/13/2012
Flow Rate	mgd	2.27			2/20/2012
Flow Rate	mgd	2.01			2/27/2012
Flow Rate	mgd	2.01			3/5/2012
Flow Rate	mgd	2.24			3/12/2012
Flow Rate	mgd	2.02			3/19/2012
Flow Rate	mgd	1.94			3/26/2012
Flow Rate	mgd	1.8			4/3/2012
Flow Rate	mgd	1.77			4/9/2012
Flow Rate	mgd	2.64			4/16/2012
Flow Rate	mgd	1.76			4/18/2012
Flow Rate	mgd	2.07			4/20/2012
Flow Rate	mgd	2.11			4/24/2012
Flow Rate	mgd	1.38			5/1/2012
Flow Rate	mgd	2.05			5/2/2012
Flow Rate	mgd	1.97			5/7/2012
Flow Rate	mgd	1.96			5/14/2012
Flow Rate	mgd	2.02			5/21/2012
Flow Rate	mgd	1.91			5/29/2012
Flow Rate	mgd	1.51			6/4/2012
Flow Rate	mgd	1.57			6/11/2012
Flow Rate	mgd	1.61			6/18/2012
Flow Rate	mgd	1.57			6/25/2012
Flow Rate	mgd	1.6			7/2/2012
Flow Rate	mgd	2.03			7/9/2012
Flow Rate	mgd	1.6			7/16/2012
Flow Rate	mgd	1.09			7/23/2012
Flow Rate	mgd	1.48			7/30/2012
Flow Rate	mgd	1.8			8/6/2012
Flow Rate	mgd	1.62			8/13/2012
Flow Rate	mgd	1.04			8/20/2012
Flow Rate	mgd	1.51			8/22/2012
Flow Rate	mgd	1.53			8/24/2012
Flow Rate	mgd	1.59			8/27/2012
Flow Rate	mgd	1.59			9/4/2012
Flow Rate	mgd	1.48			9/10/2012
Flow Rate	mgd	2.27			9/17/2012
Flow Rate	mgd	1.77			9/24/2012
Flow Rate	mgd	1.83			10/1/2012

KPDES Outfall Nonradiological Data

Table C.3.1. Nonradiological Effluent Data for Outfall 001 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
Flow Rate	mgd	1.83			10/8/2012
Flow Rate	mgd	1.91			10/15/2012
Flow Rate	mgd	1.82			10/17/2012
Flow Rate	mgd	1.83			10/19/2012
Flow Rate	mgd	1.81			10/22/2012
Flow Rate	mgd	2.04			10/29/2012
Flow Rate	mgd	1.68			11/5/2012
Flow Rate	mgd	1.99			11/13/2012
Flow Rate	mgd	1.86			11/19/2012
Flow Rate	mgd	1.88			11/26/2012
Flow Rate	mgd	2.03			12/3/2012
Flow Rate	mgd	3.31			12/10/2012
Flow Rate	mgd	2.04			12/17/2012
Flow Rate	mgd	2.58			12/27/2012
Flow Rate (Daily)	mgd	1.98			1/1/2012
Flow Rate (Daily)	mgd	1.91			1/2/2012
Flow Rate (Daily)	mgd	1.95			1/3/2012
Flow Rate (Daily)	mgd	2			1/4/2012
Flow Rate (Daily)	mgd	2.01			1/5/2012
Flow Rate (Daily)	mgd	1.99			1/6/2012
Flow Rate (Daily)	mgd	2.19			1/7/2012
Flow Rate (Daily)	mgd	2.17			1/8/2012
Flow Rate (Daily)	mgd	1.78			1/9/2012
Flow Rate (Daily)	mgd	2.16			1/10/2012
Flow Rate (Daily)	mgd	7.37			1/11/2012
Flow Rate (Daily)	mgd	2.48			1/12/2012
Flow Rate (Daily)	mgd	2.22			1/13/2012
Flow Rate (Daily)	mgd	2.17			1/14/2012
Flow Rate (Daily)	mgd	2.15			1/15/2012
Flow Rate (Daily)	mgd	2.17			1/16/2012
Flow Rate (Daily)	mgd	2.21			1/17/2012
Flow Rate (Daily)	mgd	2.18			1/18/2012
Flow Rate (Daily)	mgd	2.17			1/19/2012
Flow Rate (Daily)	mgd	2.1			1/20/2012
Flow Rate (Daily)	mgd	2.11			1/21/2012
Flow Rate (Daily)	mgd	2.15			1/22/2012
Flow Rate (Daily)	mgd	5.25			1/23/2012
Flow Rate (Daily)	mgd	2.45			1/24/2012
Flow Rate (Daily)	mgd	3.8			1/25/2012
Flow Rate (Daily)	mgd	5.91			1/26/2012
Flow Rate (Daily)	mgd	3.64			1/27/2012
Flow Rate (Daily)	mgd	2.16			1/28/2012
Flow Rate (Daily)	mgd	2.24			1/29/2012
Flow Rate (Daily)	mgd	2.19			1/30/2012
Flow Rate (Daily)	mgd	2.08			1/31/2012
Flow Rate (Daily)	mgd	2.24			2/1/2012
Flow Rate (Daily)	mgd	2.19			2/2/2012
Flow Rate (Daily)	mgd	2.14			2/3/2012
Flow Rate (Daily)	mgd	4.7			2/4/2012

KPDES Outfall Nonradiological Data

Table C.3.1. Nonradiological Effluent Data for Outfall 001 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
Flow Rate (Daily)	mgd	1.66			2/5/2012
Flow Rate (Daily)	mgd	1.49			2/6/2012
Flow Rate (Daily)	mgd	2.14			2/7/2012
Flow Rate (Daily)	mgd	2.19			2/8/2012
Flow Rate (Daily)	mgd	2.13			2/9/2012
Flow Rate (Daily)	mgd	2.18			2/10/2012
Flow Rate (Daily)	mgd	2.16			2/11/2012
Flow Rate (Daily)	mgd	2.15			2/12/2012
Flow Rate (Daily)	mgd	2.14			2/13/2012
Flow Rate (Daily)	mgd	1.86			2/14/2012
Flow Rate (Daily)	mgd	1.41			2/15/2012
Flow Rate (Daily)	mgd	2.98			2/16/2012
Flow Rate (Daily)	mgd	2.39			2/17/2012
Flow Rate (Daily)	mgd	2.37			2/18/2012
Flow Rate (Daily)	mgd	2.23			2/19/2012
Flow Rate (Daily)	mgd	2.27			2/20/2012
Flow Rate (Daily)	mgd	2.68			2/21/2012
Flow Rate (Daily)	mgd	2.03			2/22/2012
Flow Rate (Daily)	mgd	2.02			2/23/2012
Flow Rate (Daily)	mgd	1.98			2/24/2012
Flow Rate (Daily)	mgd	2.02			2/25/2012
Flow Rate (Daily)	mgd	1.98			2/26/2012
Flow Rate (Daily)	mgd	2.01			2/27/2012
Flow Rate (Daily)	mgd	2			2/28/2012
Flow Rate (Daily)	mgd	8.34			2/29/2012
Flow Rate (Daily)	mgd	2.2			3/1/2012
Flow Rate (Daily)	mgd	2.08			3/2/2012
Flow Rate (Daily)	mgd	2.03			3/3/2012
Flow Rate (Daily)	mgd	2.07			3/4/2012
Flow Rate (Daily)	mgd	2.01			3/5/2012
Flow Rate (Daily)	mgd	1.99			3/6/2012
Flow Rate (Daily)	mgd	1.88			3/7/2012
Flow Rate (Daily)	mgd	2.18			3/8/2012
Flow Rate (Daily)	mgd	2.83			3/9/2012
Flow Rate (Daily)	mgd	2.15			3/10/2012
Flow Rate (Daily)	mgd	2.04			3/11/2012
Flow Rate (Daily)	mgd	2.24			3/12/2012
Flow Rate (Daily)	mgd	2.1			3/13/2012
Flow Rate (Daily)	mgd	2.04			3/14/2012
Flow Rate (Daily)	mgd	1.96			3/15/2012
Flow Rate (Daily)	mgd	7.17			3/16/2012
Flow Rate (Daily)	mgd	2.2			3/17/2012
Flow Rate (Daily)	mgd	2.06			3/18/2012
Flow Rate (Daily)	mgd	2.02			3/19/2012
Flow Rate (Daily)	mgd	1.35			3/20/2012
Flow Rate (Daily)	mgd	1.16			3/21/2012
Flow Rate (Daily)	mgd	0.73			3/22/2012
Flow Rate (Daily)	mgd	2.62			3/23/2012
Flow Rate (Daily)	mgd	2.15			3/24/2012

KPDES Outfall Nonradiological Data

Table C.3.1. Nonradiological Effluent Data for Outfall 001 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
Flow Rate (Daily)	mgd	2.02			3/25/2012
Flow Rate (Daily)	mgd	1.94			3/26/2012
Flow Rate (Daily)	mgd	2.24			3/27/2012
Flow Rate (Daily)	mgd	2.13			3/28/2012
Flow Rate (Daily)	mgd	2.21			3/29/2012
Flow Rate (Daily)	mgd	2.05			3/30/2012
Flow Rate (Daily)	mgd	1.81			3/31/2012
Flow Rate (Daily)	mgd	1.81			4/1/2012
Flow Rate (Daily)	mgd	1.81			4/2/2012
Flow Rate (Daily)	mgd	1.8			4/3/2012
Flow Rate (Daily)	mgd	1.75			4/4/2012
Flow Rate (Daily)	mgd	1.82			4/5/2012
Flow Rate (Daily)	mgd	1.75			4/6/2012
Flow Rate (Daily)	mgd	1.77			4/7/2012
Flow Rate (Daily)	mgd	1.83			4/8/2012
Flow Rate (Daily)	mgd	1.77			4/9/2012
Flow Rate (Daily)	mgd	1.72			4/10/2012
Flow Rate (Daily)	mgd	1.74			4/11/2012
Flow Rate (Daily)	mgd	1.8			4/12/2012
Flow Rate (Daily)	mgd	1.6			4/13/2012
Flow Rate (Daily)	mgd	1.64			4/14/2012
Flow Rate (Daily)	mgd	1.7			4/15/2012
Flow Rate (Daily)	mgd	2.65			4/16/2012
Flow Rate (Daily)	mgd	1.77			4/17/2012
Flow Rate (Daily)	mgd	2.08			4/18/2012
Flow Rate (Daily)	mgd	2.09			4/19/2012
Flow Rate (Daily)	mgd	2.09			4/20/2012
Flow Rate (Daily)	mgd	2.11			4/21/2012
Flow Rate (Daily)	mgd	2.14			4/22/2012
Flow Rate (Daily)	mgd	4.13			4/23/2012
Flow Rate (Daily)	mgd	2.09			4/24/2012
Flow Rate (Daily)	mgd	2.15			4/25/2012
Flow Rate (Daily)	mgd	2.05			4/26/2012
Flow Rate (Daily)	mgd	2.13			4/27/2012
Flow Rate (Daily)	mgd	2.03			4/28/2012
Flow Rate (Daily)	mgd	2.01			4/29/2012
Flow Rate (Daily)	mgd	2.04			4/30/2012
Flow Rate (Daily)	mgd	2.94			5/1/2012
Flow Rate (Daily)	mgd	2			5/2/2012
Flow Rate (Daily)	mgd	2.09			5/3/2012
Flow Rate (Daily)	mgd	1.88			5/4/2012
Flow Rate (Daily)	mgd	2			5/5/2012
Flow Rate (Daily)	mgd	2.03			5/6/2012
Flow Rate (Daily)	mgd	1.97			5/7/2012
Flow Rate (Daily)	mgd	2.09			5/8/2012
Flow Rate (Daily)	mgd	2.04			5/9/2012
Flow Rate (Daily)	mgd	2.07			5/10/2012
Flow Rate (Daily)	mgd	1.94			5/11/2012
Flow Rate (Daily)	mgd	1.91			5/12/2012

KPDES Outfall Nonradiological Data

Table C.3.1. Nonradiological Effluent Data for Outfall 001 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
Flow Rate (Daily)	mgd	1.96			5/13/2012
Flow Rate (Daily)	mgd	1.96			5/14/2012
Flow Rate (Daily)	mgd	2.05			5/15/2012
Flow Rate (Daily)	mgd	2.04			5/16/2012
Flow Rate (Daily)	mgd	2.03			5/17/2012
Flow Rate (Daily)	mgd	2.04			5/18/2012
Flow Rate (Daily)	mgd	2.05			5/19/2012
Flow Rate (Daily)	mgd	2.09			5/20/2012
Flow Rate (Daily)	mgd	2.02			5/21/2012
Flow Rate (Daily)	mgd	1.78			5/22/2012
Flow Rate (Daily)	mgd	2.1			5/23/2012
Flow Rate (Daily)	mgd	1.9			5/24/2012
Flow Rate (Daily)	mgd	1.94			5/25/2012
Flow Rate (Daily)	mgd	1.88			5/26/2012
Flow Rate (Daily)	mgd	1.9			5/27/2012
Flow Rate (Daily)	mgd	1.9			5/28/2012
Flow Rate (Daily)	mgd	1.91			5/29/2012
Flow Rate (Daily)	mgd	1.66			5/30/2012
Flow Rate (Daily)	mgd	1.59			5/31/2012
Flow Rate (Daily)	mgd	1.59			6/1/2012
Flow Rate (Daily)	mgd	1.57			6/2/2012
Flow Rate (Daily)	mgd	1.46			6/3/2012
Flow Rate (Daily)	mgd	1.51			6/4/2012
Flow Rate (Daily)	mgd	2			6/5/2012
Flow Rate (Daily)	mgd	0.99			6/6/2012
Flow Rate (Daily)	mgd	0.93			6/7/2012
Flow Rate (Daily)	mgd	0.92			6/8/2012
Flow Rate (Daily)	mgd	1.49			6/9/2012
Flow Rate (Daily)	mgd	1.52			6/10/2012
Flow Rate (Daily)	mgd	1.57			6/11/2012
Flow Rate (Daily)	mgd	1.77			6/12/2012
Flow Rate (Daily)	mgd	1.6			6/13/2012
Flow Rate (Daily)	mgd	1.64			6/14/2012
Flow Rate (Daily)	mgd	1.59			6/15/2012
Flow Rate (Daily)	mgd	1.62			6/16/2012
Flow Rate (Daily)	mgd	1.6			6/17/2012
Flow Rate (Daily)	mgd	1.61			6/18/2012
Flow Rate (Daily)	mgd	1.51			6/19/2012
Flow Rate (Daily)	mgd	1.53			6/20/2012
Flow Rate (Daily)	mgd	1.51			6/21/2012
Flow Rate (Daily)	mgd	1.56			6/22/2012
Flow Rate (Daily)	mgd	1.53			6/23/2012
Flow Rate (Daily)	mgd	1.53			6/24/2012
Flow Rate (Daily)	mgd	1.56			6/25/2012
Flow Rate (Daily)	mgd	1.7			6/26/2012
Flow Rate (Daily)	mgd	1.53			6/27/2012
Flow Rate (Daily)	mgd	1.58			6/28/2012
Flow Rate (Daily)	mgd	1.59			6/29/2012
Flow Rate (Daily)	mgd	1.59			6/30/2012

KPDES Outfall Nonradiological Data

Table C.3.1. Nonradiological Effluent Data for Outfall 001 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
Flow Rate (Daily)	mgd	1.6			7/1/2012
Flow Rate (Daily)	mgd	1.6			7/2/2012
Flow Rate (Daily)	mgd	1.54			7/3/2012
Flow Rate (Daily)	mgd	1.62			7/4/2012
Flow Rate (Daily)	mgd	1.62			7/5/2012
Flow Rate (Daily)	mgd	1.61			7/6/2012
Flow Rate (Daily)	mgd	1.6			7/7/2012
Flow Rate (Daily)	mgd	1.56			7/8/2012
Flow Rate (Daily)	mgd	2.03			7/9/2012
Flow Rate (Daily)	mgd	1.6			7/10/2012
Flow Rate (Daily)	mgd	1.49			7/11/2012
Flow Rate (Daily)	mgd	1.59			7/12/2012
Flow Rate (Daily)	mgd	1.58			7/13/2012
Flow Rate (Daily)	mgd	1.58			7/14/2012
Flow Rate (Daily)	mgd	1.58			7/15/2012
Flow Rate (Daily)	mgd	1.6			7/16/2012
Flow Rate (Daily)	mgd	1.62			7/17/2012
Flow Rate (Daily)	mgd	1.64			7/18/2012
Flow Rate (Daily)	mgd	1.62			7/19/2012
Flow Rate (Daily)	mgd	1.7			7/20/2012
Flow Rate (Daily)	mgd	1.18			7/21/2012
Flow Rate (Daily)	mgd	1.14			7/22/2012
Flow Rate (Daily)	mgd	1.09			7/23/2012
Flow Rate (Daily)	mgd	1.19			7/24/2012
Flow Rate (Daily)	mgd	1.67			7/25/2012
Flow Rate (Daily)	mgd	1.67			7/26/2012
Flow Rate (Daily)	mgd	2.01			7/27/2012
Flow Rate (Daily)	mgd	1.22			7/28/2012
Flow Rate (Daily)	mgd	1.4			7/29/2012
Flow Rate (Daily)	mgd	1.47			7/30/2012
Flow Rate (Daily)	mgd	1.3			7/31/2012
Flow Rate (Daily)	mgd	1.58			8/1/2012
Flow Rate (Daily)	mgd	1.63			8/2/2012
Flow Rate (Daily)	mgd	1.59			8/3/2012
Flow Rate (Daily)	mgd	2.24			8/4/2012
Flow Rate (Daily)	mgd	2.12			8/5/2012
Flow Rate (Daily)	mgd	1.79			8/6/2012
Flow Rate (Daily)	mgd	1.54			8/7/2012
Flow Rate (Daily)	mgd	1.52			8/8/2012
Flow Rate (Daily)	mgd	1.49			8/9/2012
Flow Rate (Daily)	mgd	1.51			8/10/2012
Flow Rate (Daily)	mgd	1.48			8/11/2012
Flow Rate (Daily)	mgd	1.5			8/12/2012
Flow Rate (Daily)	mgd	1.62			8/13/2012
Flow Rate (Daily)	mgd	1.68			8/14/2012
Flow Rate (Daily)	mgd	1.52			8/15/2012
Flow Rate (Daily)	mgd	1.53			8/16/2012
Flow Rate (Daily)	mgd	2.56			8/17/2012
Flow Rate (Daily)	mgd	0.84			8/18/2012

KPDES Outfall Nonradiological Data

Table C.3.1. Nonradiological Effluent Data for Outfall 001 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
Flow Rate (Daily)	mgd	0.73			8/19/2012
Flow Rate (Daily)	mgd	1.04			8/20/2012
Flow Rate (Daily)	mgd	1.48			8/21/2012
Flow Rate (Daily)	mgd	1.52			8/22/2012
Flow Rate (Daily)	mgd	1.56			8/23/2012
Flow Rate (Daily)	mgd	1.53			8/24/2012
Flow Rate (Daily)	mgd	1.57			8/25/2012
Flow Rate (Daily)	mgd	1.56			8/26/2012
Flow Rate (Daily)	mgd	1.52			8/27/2012
Flow Rate (Daily)	mgd	1.59			8/28/2012
Flow Rate (Daily)	mgd	1.58			8/29/2012
Flow Rate (Daily)	mgd	1.58			8/30/2012
Flow Rate (Daily)	mgd	1.58			8/31/2012
Flow Rate (Daily)	mgd	3.77			9/1/2012
Flow Rate (Daily)	mgd	5.44			9/2/2012
Flow Rate (Daily)	mgd	1.8			9/3/2012
Flow Rate (Daily)	mgd	1.59			9/4/2012
Flow Rate (Daily)	mgd	1.56			9/5/2012
Flow Rate (Daily)	mgd	1.52			9/6/2012
Flow Rate (Daily)	mgd	2.27			9/7/2012
Flow Rate (Daily)	mgd	4.15			9/8/2012
Flow Rate (Daily)	mgd	1.64			9/9/2012
Flow Rate (Daily)	mgd	1.48			9/10/2012
Flow Rate (Daily)	mgd	2.23			9/11/2012
Flow Rate (Daily)	mgd	1.6			9/12/2012
Flow Rate (Daily)	mgd	1.52			9/13/2012
Flow Rate (Daily)	mgd	1.55			9/14/2012
Flow Rate (Daily)	mgd	1.53			9/15/2012
Flow Rate (Daily)	mgd	1.63			9/16/2012
Flow Rate (Daily)	mgd	2.27			9/17/2012
Flow Rate (Daily)	mgd	1.76			9/18/2012
Flow Rate (Daily)	mgd	1.67			9/19/2012
Flow Rate (Daily)	mgd	1.67			9/20/2012
Flow Rate (Daily)	mgd	1.8			9/21/2012
Flow Rate (Daily)	mgd	1.8			9/22/2012
Flow Rate (Daily)	mgd	1.76			9/23/2012
Flow Rate (Daily)	mgd	1.77			9/24/2012
Flow Rate (Daily)	mgd	1.75			9/25/2012
Flow Rate (Daily)	mgd	1.66			9/26/2012
Flow Rate (Daily)	mgd	3.55			9/27/2012
Flow Rate (Daily)	mgd	8.84			9/28/2012
Flow Rate (Daily)	mgd	2.01			9/29/2012
Flow Rate (Daily)	mgd	1.82			9/30/2012
Flow Rate (Daily)	mgd	1.83			10/1/2012
Flow Rate (Daily)	mgd	2.69			10/2/2012
Flow Rate (Daily)	mgd	1.82			10/3/2012
Flow Rate (Daily)	mgd	1.83			10/4/2012
Flow Rate (Daily)	mgd	1.84			10/5/2012
Flow Rate (Daily)	mgd	2.68			10/6/2012

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Table C.3.1. Nonradiological Effluent Data for Outfall 001 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
Flow Rate (Daily)	mgd	1.87			10/7/2012
Flow Rate (Daily)	mgd	1.83			10/8/2012
Flow Rate (Daily)	mgd	1.86			10/9/2012
Flow Rate (Daily)	mgd	1.85			10/10/2012
Flow Rate (Daily)	mgd	1.79			10/11/2012
Flow Rate (Daily)	mgd	2.49			10/12/2012
Flow Rate (Daily)	mgd	1.87			10/13/2012
Flow Rate (Daily)	mgd	2.14			10/14/2012
Flow Rate (Daily)	mgd	1.91			10/15/2012
Flow Rate (Daily)	mgd	1.87			10/16/2012
Flow Rate (Daily)	mgd	1.82			10/17/2012
Flow Rate (Daily)	mgd	3.5			10/18/2012
Flow Rate (Daily)	mgd	1.83			10/19/2012
Flow Rate (Daily)	mgd	1.83			10/20/2012
Flow Rate (Daily)	mgd	1.83			10/21/2012
Flow Rate (Daily)	mgd	1.81			10/22/2012
Flow Rate (Daily)	mgd	1.83			10/23/2012
Flow Rate (Daily)	mgd	1.89			10/24/2012
Flow Rate (Daily)	mgd	1.86			10/25/2012
Flow Rate (Daily)	mgd	8.06			10/26/2012
Flow Rate (Daily)	mgd	2.27			10/27/2012
Flow Rate (Daily)	mgd	2.06			10/28/2012
Flow Rate (Daily)	mgd	2.05			10/29/2012
Flow Rate (Daily)	mgd	2.07			10/30/2012
Flow Rate (Daily)	mgd	2.12			10/31/2012
Flow Rate (Daily)	mgd	1.74			11/1/2012
Flow Rate (Daily)	mgd	1.7			11/2/2012
Flow Rate (Daily)	mgd	1.68			11/3/2012
Flow Rate (Daily)	mgd	1.69			11/4/2012
Flow Rate (Daily)	mgd	1.68			11/5/2012
Flow Rate (Daily)	mgd	1.92			11/6/2012
Flow Rate (Daily)	mgd	1.85			11/7/2012
Flow Rate (Daily)	mgd	1.86			11/8/2012
Flow Rate (Daily)	mgd	1.86			11/9/2012
Flow Rate (Daily)	mgd	1.81			11/10/2012
Flow Rate (Daily)	mgd	1.82			11/11/2012
Flow Rate (Daily)	mgd	9.21			11/12/2012
Flow Rate (Daily)	mgd	2.02			11/13/2012
Flow Rate (Daily)	mgd	1.87			11/14/2012
Flow Rate (Daily)	mgd	1.85			11/15/2012
Flow Rate (Daily)	mgd	1.88			11/16/2012
Flow Rate (Daily)	mgd	1.88			11/17/2012
Flow Rate (Daily)	mgd	1.83			11/18/2012
Flow Rate (Daily)	mgd	1.86			11/19/2012
Flow Rate (Daily)	mgd	1.83			11/20/2012
Flow Rate (Daily)	mgd	1.86			11/21/2012
Flow Rate (Daily)	mgd	1.86			11/22/2012
Flow Rate (Daily)	mgd	1.86			11/23/2012
Flow Rate (Daily)	mgd	1.82			11/24/2012

KPDES Outfall Nonradiological Data

Table C.3.1. Nonradiological Effluent Data for Outfall 001 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
Flow Rate (Daily)	mgd	1.82			11/25/2012	
Flow Rate (Daily)	mgd	1.88			11/26/2012	
Flow Rate (Daily)	mgd	2.54			11/27/2012	
Flow Rate (Daily)	mgd	1.91			11/28/2012	
Flow Rate (Daily)	mgd	2			11/29/2012	
Flow Rate (Daily)	mgd	1.98			11/30/2012	
Flow Rate (Daily)	mgd	1.99			12/1/2012	
Flow Rate (Daily)	mgd	2.01			12/2/2012	
Flow Rate (Daily)	mgd	2.03			12/3/2012	
Flow Rate (Daily)	mgd	1.99			12/4/2012	
Flow Rate (Daily)	mgd	2.14			12/5/2012	
Flow Rate (Daily)	mgd	2.06			12/6/2012	
Flow Rate (Daily)	mgd	2.11			12/7/2012	
Flow Rate (Daily)	mgd	2.1			12/8/2012	
Flow Rate (Daily)	mgd	2.23			12/9/2012	
Flow Rate (Daily)	mgd	3.31			12/10/2012	
Flow Rate (Daily)	mgd	2.11			12/11/2012	
Flow Rate (Daily)	mgd	2.02			12/12/2012	
Flow Rate (Daily)	mgd	2.01			12/13/2012	
Flow Rate (Daily)	mgd	2.06			12/14/2012	
Flow Rate (Daily)	mgd	2.13			12/15/2012	
Flow Rate (Daily)	mgd	2.09			12/16/2012	
Flow Rate (Daily)	mgd	2.04			12/17/2012	
Flow Rate (Daily)	mgd	2.02			12/18/2012	
Flow Rate (Daily)	mgd	1.97			12/19/2012	
Flow Rate (Daily)	mgd	3.28			12/20/2012	
Flow Rate (Daily)	mgd	2.11			12/21/2012	
Flow Rate (Daily)	mgd	2			12/22/2012	
Flow Rate (Daily)	mgd	1.99			12/23/2012	
Flow Rate (Daily)	mgd	2.05			12/24/2012	
Flow Rate (Daily)	mgd	1.98			12/25/2012	
Flow Rate (Daily)	mgd	2.47			12/26/2012	
Flow Rate (Daily)	mgd	2.58			12/27/2012	
Flow Rate (Daily)	mgd	2.31			12/28/2012	
Flow Rate (Daily)	mgd	4.22			12/29/2012	
Flow Rate (Daily)	mgd	2.17			12/30/2012	
Flow Rate (Daily)	mgd	2.13			12/31/2012	
Hardness - Total as CaCO3	mg/L	360	10		1/3/2012	
Hardness - Total as CaCO3	mg/L	350	10		4/3/2012	
Hardness - Total as CaCO3	mg/L	380	10		7/2/2012	Duplicate
Hardness - Total as CaCO3	mg/L	370	10		7/2/2012	
Hardness - Total as CaCO3	mg/L	290	10		10/1/2012	
Heptachlor	µg/L	0.0005	0.0005	U	1/3/2012	
Heptachlor	µg/L	0.0005	0.0005	U	4/3/2012	
Heptachlor	µg/L	0.0005	0.0005	U	7/2/2012	
Heptachlor	µg/L	0.0005	0.0005	U	7/2/2012	Duplicate
Heptachlor	µg/L	0.0005	0.0005	U	10/1/2012	
Indeno(1,2,3-cd)pyrene	µg/L	0.01	0.01	U	1/3/2012	
Indeno(1,2,3-cd)pyrene	µg/L	0.1	0.01		4/3/2012	

KPDES Outfall Nonradiological Data

Table C.3.1. Nonradiological Effluent Data for Outfall 001 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
Indeno(1,2,3-cd)pyrene	µg/L	0.01	0.01	U	7/2/2012	Duplicate
Indeno(1,2,3-cd)pyrene	µg/L	0.01	0.01	U	7/2/2012	
Indeno(1,2,3-cd)pyrene	µg/L	0.01	0.01	U	10/1/2012	
Oil and Grease	mg/L	7	7	U	1/3/2012	
Oil and Grease	mg/L	7	7	U	1/9/2012	
Oil and Grease	mg/L	7	7	U	1/17/2012	
Oil and Grease	mg/L	7	7	U	1/23/2012	
Oil and Grease	mg/L	7	7	U	1/30/2012	
Oil and Grease	mg/L	7	7	U	2/6/2012	
Oil and Grease	mg/L	7	7	U	2/13/2012	
Oil and Grease	mg/L	7	7	U	2/20/2012	
Oil and Grease	mg/L	7	7	U	2/27/2012	
Oil and Grease	mg/L	7	7	U	3/5/2012	
Oil and Grease	mg/L	7	7	U	3/12/2012	
Oil and Grease	mg/L	7	7	U	3/19/2012	
Oil and Grease	mg/L	7	7	U	3/26/2012	
Oil and Grease	mg/L	7	7	U	4/3/2012	
Oil and Grease	mg/L	7	7	U	4/9/2012	
Oil and Grease	mg/L	7	7	U	4/16/2012	
Oil and Grease	mg/L	7	7	U	4/24/2012	
Oil and Grease	mg/L	7	7	U	5/1/2012	Duplicate
Oil and Grease	mg/L	7	7	U	5/1/2012	
Oil and Grease	mg/L	7	7	U	5/7/2012	
Oil and Grease	mg/L	7	7	U	5/14/2012	
Oil and Grease	mg/L	7	7	U	5/21/2012	
Oil and Grease	mg/L	7	7	U	5/29/2012	
Oil and Grease	mg/L	7	7	U	6/4/2012	
Oil and Grease	mg/L	7	7	U	6/11/2012	
Oil and Grease	mg/L	7	7	U	6/18/2012	
Oil and Grease	mg/L	7	7	U	6/25/2012	
Oil and Grease	mg/L	7	7	U	7/2/2012	
Oil and Grease	mg/L	7	7	U	7/9/2012	
Oil and Grease	mg/L	7	7	U	7/16/2012	
Oil and Grease	mg/L	7	7	U	7/23/2012	
Oil and Grease	mg/L	7	7	U	7/30/2012	
Oil and Grease	mg/L	7	7	U	8/6/2012	
Oil and Grease	mg/L	7	7	*U	8/13/2012	
Oil and Grease	mg/L	7	7	U	8/20/2012	
Oil and Grease	mg/L	7	7	U	8/27/2012	
Oil and Grease	mg/L	7	7	U	9/4/2012	
Oil and Grease	mg/L	7	7	U	9/10/2012	
Oil and Grease	mg/L	7	7	U	9/17/2012	
Oil and Grease	mg/L	7	7	U	9/24/2012	
Oil and Grease	mg/L	7	7	U	10/1/2012	
Oil and Grease	mg/L	7	7	U	10/8/2012	
Oil and Grease	mg/L	7	7	U	10/15/2012	
Oil and Grease	mg/L	7	7	U	10/22/2012	
Oil and Grease	mg/L	7	7	U	10/29/2012	
Oil and Grease	mg/L	7	7	U	11/5/2012	

KPDES Outfall Nonradiological Data

Table C.3.1. Nonradiological Effluent Data for Outfall 001 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
Oil and Grease	mg/L	7	7	U	11/13/2012	Duplicate
Oil and Grease	mg/L	7	7	U	11/13/2012	
Oil and Grease	mg/L	7	7	U	11/19/2012	
Oil and Grease	mg/L	7	7	U	11/26/2012	
Oil and Grease	mg/L	7	7	U	12/3/2012	
Oil and Grease	mg/L	7	7	U	12/10/2012	
Oil and Grease	mg/L	7	7	U	12/17/2012	
Oil and Grease	mg/L	7	7	U	12/27/2012	
PCB-1016	µg/L	0.17	0.17	U	1/3/2012	
PCB-1016	µg/L	0.17	0.17	U	1/9/2012	
PCB-1016	µg/L	0.17	0.17	U	1/17/2012	
PCB-1016	µg/L	0.17	0.17	U	1/23/2012	
PCB-1016	µg/L	0.17	0.17	U	1/30/2012	
PCB-1016	µg/L	0.17	0.17	U	2/6/2012	
PCB-1016	µg/L	0.17	0.17	U	2/13/2012	
PCB-1016	µg/L	0.17	0.17	UX	2/20/2012	
PCB-1016	µg/L	0.17	0.17	UY	2/27/2012	
PCB-1016	µg/L	0.17	0.17	U	3/5/2012	
PCB-1016	µg/L	0.17	0.17	U	3/12/2012	
PCB-1016	µg/L	0.17	0.17	U	3/19/2012	
PCB-1016	µg/L	0.17	0.17	UY	3/26/2012	
PCB-1016	µg/L	0.17	0.17	U	4/3/2012	
PCB-1016	µg/L	0.17	0.17	U	4/9/2012	
PCB-1016	µg/L	0.17	0.17	U	4/16/2012	
PCB-1016	µg/L	0.17	0.17	U	4/24/2012	
PCB-1016	µg/L	0.17	0.17	U	5/1/2012	
PCB-1016	µg/L	0.17	0.17	U	5/1/2012	Duplicate
PCB-1016	µg/L	0.17	0.17	U	5/7/2012	
PCB-1016	µg/L	0.17	0.17	U	5/14/2012	
PCB-1016	µg/L	0.17	0.17	UY	5/21/2012	
PCB-1016	µg/L	0.18	0.18	U	5/29/2012	
PCB-1016	µg/L	0.17	0.17	U	6/4/2012	
PCB-1016	µg/L	0.17	0.17	U	6/11/2012	
PCB-1016	µg/L	0.17	0.17	UX	6/18/2012	
PCB-1016	µg/L	0.17	0.17	U	6/25/2012	
PCB-1016	µg/L	0.17	0.17	U	7/2/2012	
PCB-1016	µg/L	0.17	0.17	U	7/9/2012	
PCB-1016	µg/L	0.17	0.17	U	7/16/2012	
PCB-1016	µg/L	0.17	0.17	U	7/23/2012	
PCB-1016	µg/L	0.17	0.17	U	7/30/2012	
PCB-1016	µg/L	0.17	0.17	U	8/6/2012	
PCB-1016	µg/L	0.16	0.16	U	8/13/2012	
PCB-1016	µg/L	0.17	0.17	U	8/20/2012	
PCB-1016	µg/L	0.16	0.16	U	8/27/2012	
PCB-1016	µg/L	0.16	0.16	U	9/4/2012	
PCB-1016	µg/L	0.17	0.17	U	9/10/2012	
PCB-1016	µg/L	0.17	0.17	UY	9/17/2012	
PCB-1016	µg/L	0.16	0.16	U	9/24/2012	
PCB-1016	µg/L	0.17	0.17	U	10/1/2012	

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Table C.3.1. Nonradiological Effluent Data for Outfall 001 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
PCB-1016	µg/L	0.16	0.16	U	10/8/2012	
PCB-1016	µg/L	0.16	0.16	U	10/15/2012	
PCB-1016	µg/L	0.17	0.17	UY	10/22/2012	
PCB-1016	µg/L	0.17	0.17	U	10/29/2012	
PCB-1016	µg/L	0.17	0.17	U	11/5/2012	
PCB-1016	µg/L	0.17	0.17	UY	11/13/2012	Duplicate
PCB-1016	µg/L	0.17	0.17	UY	11/13/2012	
PCB-1016	µg/L	0.17	0.17	U	11/19/2012	
PCB-1016	µg/L	0.16	0.16	U	11/26/2012	
PCB-1016	µg/L	0.16	0.16	UY	12/3/2012	
PCB-1016	µg/L	0.16	0.16	U	12/10/2012	
PCB-1016	µg/L	0.17	0.17	U	12/17/2012	
PCB-1016	µg/L	0.17	0.17	U	12/27/2012	
PCB-1221	µg/L	0.18	0.18	U	1/3/2012	
PCB-1221	µg/L	0.18	0.18	U	1/9/2012	
PCB-1221	µg/L	0.18	0.18	U	1/17/2012	
PCB-1221	µg/L	0.18	0.18	U	1/23/2012	
PCB-1221	µg/L	0.18	0.18	U	1/30/2012	
PCB-1221	µg/L	0.18	0.18	U	2/6/2012	
PCB-1221	µg/L	0.18	0.18	U	2/13/2012	
PCB-1221	µg/L	0.18	0.18	UX	2/20/2012	
PCB-1221	µg/L	0.18	0.18	UY	2/27/2012	
PCB-1221	µg/L	0.18	0.18	U	3/5/2012	
PCB-1221	µg/L	0.18	0.18	U	3/12/2012	
PCB-1221	µg/L	0.18	0.18	U	3/19/2012	
PCB-1221	µg/L	0.18	0.18	UY	3/26/2012	
PCB-1221	µg/L	0.18	0.18	U	4/3/2012	
PCB-1221	µg/L	0.18	0.18	U	4/9/2012	
PCB-1221	µg/L	0.18	0.18	U	4/16/2012	
PCB-1221	µg/L	0.18	0.18	U	4/24/2012	
PCB-1221	µg/L	0.18	0.18	U	5/1/2012	Duplicate
PCB-1221	µg/L	0.18	0.18	U	5/1/2012	
PCB-1221	µg/L	0.18	0.18	U	5/7/2012	
PCB-1221	µg/L	0.18	0.18	U	5/14/2012	
PCB-1221	µg/L	0.18	0.18	UY	5/21/2012	
PCB-1221	µg/L	0.19	0.19	U	5/29/2012	
PCB-1221	µg/L	0.18	0.18	U	6/4/2012	
PCB-1221	µg/L	0.18	0.18	U	6/11/2012	
PCB-1221	µg/L	0.18	0.18	UX	6/18/2012	
PCB-1221	µg/L	0.18	0.18	U	6/25/2012	
PCB-1221	µg/L	0.18	0.18	U	7/2/2012	
PCB-1221	µg/L	0.18	0.18	U	7/9/2012	
PCB-1221	µg/L	0.18	0.18	U	7/16/2012	
PCB-1221	µg/L	0.18	0.18	U	7/23/2012	
PCB-1221	µg/L	0.18	0.18	U	7/30/2012	
PCB-1221	µg/L	0.18	0.18	U	8/6/2012	
PCB-1221	µg/L	0.17	0.17	U	8/13/2012	
PCB-1221	µg/L	0.18	0.18	U	8/20/2012	
PCB-1221	µg/L	0.17	0.17	U	8/27/2012	

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Table C.3.1. Nonradiological Effluent Data for Outfall 001 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
PCB-1221	µg/L	0.17	0.17	U	9/4/2012	
PCB-1221	µg/L	0.18	0.18	U	9/10/2012	
PCB-1221	µg/L	0.18	0.18	U	9/17/2012	
PCB-1221	µg/L	0.17	0.17	U	9/24/2012	
PCB-1221	µg/L	0.18	0.18	U	10/1/2012	
PCB-1221	µg/L	0.17	0.17	U	10/8/2012	
PCB-1221	µg/L	0.17	0.17	U	10/15/2012	
PCB-1221	µg/L	0.18	0.18	UY	10/22/2012	
PCB-1221	µg/L	0.18	0.18	U	10/29/2012	
PCB-1221	µg/L	0.18	0.18	U	11/5/2012	
PCB-1221	µg/L	0.18	0.18	UY	11/13/2012	Duplicate
PCB-1221	µg/L	0.18	0.18	UY	11/13/2012	
PCB-1221	µg/L	0.18	0.18	U	11/19/2012	
PCB-1221	µg/L	0.17	0.17	U	11/26/2012	
PCB-1221	µg/L	0.17	0.17	UY	12/3/2012	
PCB-1221	µg/L	0.17	0.17	U	12/10/2012	
PCB-1221	µg/L	0.18	0.18	U	12/17/2012	
PCB-1221	µg/L	0.18	0.18	U	12/27/2012	
PCB-1232	µg/L	0.14	0.14	U	1/3/2012	
PCB-1232	µg/L	0.14	0.14	U	1/9/2012	
PCB-1232	µg/L	0.14	0.14	U	1/17/2012	
PCB-1232	µg/L	0.14	0.14	U	1/23/2012	
PCB-1232	µg/L	0.14	0.14	U	1/30/2012	
PCB-1232	µg/L	0.14	0.14	U	2/6/2012	
PCB-1232	µg/L	0.14	0.14	U	2/13/2012	
PCB-1232	µg/L	0.14	0.14	UX	2/20/2012	
PCB-1232	µg/L	0.14	0.14	UY	2/27/2012	
PCB-1232	µg/L	0.14	0.14	U	3/5/2012	
PCB-1232	µg/L	0.14	0.14	U	3/12/2012	
PCB-1232	µg/L	0.14	0.14	U	3/19/2012	
PCB-1232	µg/L	0.14	0.14	UY	3/26/2012	
PCB-1232	µg/L	0.14	0.14	U	4/3/2012	
PCB-1232	µg/L	0.14	0.14	U	4/9/2012	
PCB-1232	µg/L	0.14	0.14	U	4/16/2012	
PCB-1232	µg/L	0.14	0.14	U	4/24/2012	
PCB-1232	µg/L	0.14	0.14	U	5/1/2012	Duplicate
PCB-1232	µg/L	0.14	0.14	U	5/1/2012	
PCB-1232	µg/L	0.14	0.14	U	5/7/2012	
PCB-1232	µg/L	0.14	0.14	U	5/14/2012	
PCB-1232	µg/L	0.14	0.14	UY	5/21/2012	
PCB-1232	µg/L	0.14	0.14	U	5/29/2012	
PCB-1232	µg/L	0.14	0.14	U	6/4/2012	
PCB-1232	µg/L	0.14	0.14	U	6/11/2012	
PCB-1232	µg/L	0.14	0.14	UX	6/18/2012	
PCB-1232	µg/L	0.14	0.14	U	6/25/2012	
PCB-1232	µg/L	0.14	0.14	U	7/2/2012	
PCB-1232	µg/L	0.14	0.14	U	7/9/2012	
PCB-1232	µg/L	0.14	0.14	U	7/16/2012	
PCB-1232	µg/L	0.14	0.14	U	7/23/2012	

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Table C.3.1. Nonradiological Effluent Data for Outfall 001 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
PCB-1232	µg/L	0.14	0.14	U	7/30/2012	
PCB-1232	µg/L	0.14	0.14	U	8/6/2012	
PCB-1232	µg/L	0.14	0.14	U	8/13/2012	
PCB-1232	µg/L	0.14	0.14	U	8/20/2012	
PCB-1232	µg/L	0.14	0.14	U	8/27/2012	
PCB-1232	µg/L	0.14	0.14	U	9/4/2012	
PCB-1232	µg/L	0.14	0.14	U	9/10/2012	
PCB-1232	µg/L	0.14	0.14	U	9/17/2012	
PCB-1232	µg/L	0.14	0.14	U	9/24/2012	
PCB-1232	µg/L	0.14	0.14	U	10/1/2012	
PCB-1232	µg/L	0.14	0.14	U	10/8/2012	
PCB-1232	µg/L	0.13	0.13	U	10/15/2012	
PCB-1232	µg/L	0.14	0.14	UY	10/22/2012	
PCB-1232	µg/L	0.14	0.14	U	10/29/2012	
PCB-1232	µg/L	0.14	0.14	U	11/5/2012	
PCB-1232	µg/L	0.14	0.14	UY	11/13/2012	
PCB-1232	µg/L	0.14	0.14	UY	11/13/2012	Duplicate
PCB-1232	µg/L	0.14	0.14	U	11/19/2012	
PCB-1232	µg/L	0.14	0.14	U	11/26/2012	
PCB-1232	µg/L	0.13	0.13	UY	12/3/2012	
PCB-1232	µg/L	0.14	0.14	U	12/10/2012	
PCB-1232	µg/L	0.14	0.14	U	12/17/2012	
PCB-1232	µg/L	0.14	0.14	U	12/27/2012	
PCB-1242	µg/L	0.1	0.1	U	1/3/2012	
PCB-1242	µg/L	0.1	0.1	U	1/9/2012	
PCB-1242	µg/L	0.1	0.1	U	1/17/2012	
PCB-1242	µg/L	0.1	0.1	U	1/23/2012	
PCB-1242	µg/L	0.1	0.1	U	1/30/2012	
PCB-1242	µg/L	0.1	0.1	U	2/6/2012	
PCB-1242	µg/L	0.1	0.1	U	2/13/2012	
PCB-1242	µg/L	0.1	0.1	UX	2/20/2012	
PCB-1242	µg/L	0.1	0.1	UY	2/27/2012	
PCB-1242	µg/L	0.1	0.1	U	3/5/2012	
PCB-1242	µg/L	0.1	0.1	U	3/12/2012	
PCB-1242	µg/L	0.1	0.1	U	3/19/2012	
PCB-1242	µg/L	0.1	0.1	UY	3/26/2012	
PCB-1242	µg/L	0.1	0.1	U	4/3/2012	
PCB-1242	µg/L	0.1	0.1	U	4/9/2012	
PCB-1242	µg/L	0.1	0.1	U	4/16/2012	
PCB-1242	µg/L	0.1	0.1	U	4/24/2012	
PCB-1242	µg/L	0.1	0.1	U	5/1/2012	
PCB-1242	µg/L	0.1	0.1	U	5/1/2012	Duplicate
PCB-1242	µg/L	0.1	0.1	U	5/7/2012	
PCB-1242	µg/L	0.1	0.1	U	5/14/2012	
PCB-1242	µg/L	0.1	0.1	UY	5/21/2012	
PCB-1242	µg/L	0.1	0.1	U	5/29/2012	
PCB-1242	µg/L	0.1	0.1	U	6/4/2012	
PCB-1242	µg/L	0.1	0.1	U	6/11/2012	
PCB-1242	µg/L	0.1	0.1	UX	6/18/2012	

KPDES Outfall Nonradiological Data

Table C.3.1. Nonradiological Effluent Data for Outfall 001 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
PCB-1242	µg/L	0.1	0.1	U	6/25/2012	
PCB-1242	µg/L	0.1	0.1	U	7/2/2012	
PCB-1242	µg/L	0.1	0.1	U	7/9/2012	
PCB-1242	µg/L	0.1	0.1	U	7/16/2012	
PCB-1242	µg/L	0.1	0.1	U	7/23/2012	
PCB-1242	µg/L	0.1	0.1	U	7/30/2012	
PCB-1242	µg/L	0.1	0.1	U	8/6/2012	
PCB-1242	µg/L	0.1	0.1	U	8/13/2012	
PCB-1242	µg/L	0.1	0.1	U	8/20/2012	
PCB-1242	µg/L	0.1	0.1	U	8/27/2012	
PCB-1242	µg/L	0.1	0.1	U	9/4/2012	
PCB-1242	µg/L	0.1	0.1	U	9/10/2012	
PCB-1242	µg/L	0.1	0.1	U	9/17/2012	
PCB-1242	µg/L	0.1	0.1	U	9/24/2012	
PCB-1242	µg/L	0.1	0.1	U	10/1/2012	
PCB-1242	µg/L	0.1	0.1	U	10/8/2012	
PCB-1242	µg/L	0.1	0.1	U	10/15/2012	
PCB-1242	µg/L	0.1	0.1	UY	10/22/2012	
PCB-1242	µg/L	0.1	0.1	U	10/29/2012	
PCB-1242	µg/L	0.1	0.1	U	11/5/2012	
PCB-1242	µg/L	0.1	0.1	UY	11/13/2012	
PCB-1242	µg/L	0.1	0.1	UY	11/13/2012	Duplicate
PCB-1242	µg/L	0.1	0.1	U	11/19/2012	
PCB-1242	µg/L	0.1	0.1	U	11/26/2012	
PCB-1242	µg/L	0.1	0.1	UY	12/3/2012	
PCB-1242	µg/L	0.1	0.1	U	12/10/2012	
PCB-1242	µg/L	0.1	0.1	U	12/17/2012	
PCB-1242	µg/L	0.1	0.1	U	12/27/2012	
PCB-1248	µg/L	0.12	0.12	U	1/3/2012	
PCB-1248	µg/L	0.12	0.12	U	1/9/2012	
PCB-1248	µg/L	0.12	0.12	U	1/17/2012	
PCB-1248	µg/L	0.12	0.12	U	1/23/2012	
PCB-1248	µg/L	0.12	0.12	U	1/30/2012	
PCB-1248	µg/L	0.12	0.12	U	2/6/2012	
PCB-1248	µg/L	0.12	0.12	U	2/13/2012	
PCB-1248	µg/L	0.12	0.12	UX	2/20/2012	
PCB-1248	µg/L	0.12	0.12	UY	2/27/2012	
PCB-1248	µg/L	0.12	0.12	U	3/5/2012	
PCB-1248	µg/L	0.12	0.12	U	3/12/2012	
PCB-1248	µg/L	0.12	0.12	U	3/19/2012	
PCB-1248	µg/L	0.12	0.12	UY	3/26/2012	
PCB-1248	µg/L	0.12	0.12	U	4/3/2012	
PCB-1248	µg/L	0.12	0.12	U	4/9/2012	
PCB-1248	µg/L	0.12	0.12	U	4/16/2012	
PCB-1248	µg/L	0.12	0.12	U	4/24/2012	
PCB-1248	µg/L	0.12	0.12	U	5/1/2012	Duplicate
PCB-1248	µg/L	0.12	0.12	U	5/1/2012	
PCB-1248	µg/L	0.12	0.12	U	5/7/2012	
PCB-1248	µg/L	0.12	0.12	U	5/14/2012	

KPDES Outfall Nonradiological Data

Table C.3.1. Nonradiological Effluent Data for Outfall 001 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
PCB-1248	µg/L	0.12	0.12	UY	5/21/2012	
PCB-1248	µg/L	0.12	0.12	U	5/29/2012	
PCB-1248	µg/L	0.12	0.12	U	6/4/2012	
PCB-1248	µg/L	0.12	0.12	U	6/11/2012	
PCB-1248	µg/L	0.12	0.12	UX	6/18/2012	
PCB-1248	µg/L	0.12	0.12	U	6/25/2012	
PCB-1248	µg/L	0.12	0.12	U	7/2/2012	
PCB-1248	µg/L	0.12	0.12	U	7/9/2012	
PCB-1248	µg/L	0.12	0.12	U	7/16/2012	
PCB-1248	µg/L	0.12	0.12	U	7/23/2012	
PCB-1248	µg/L	0.12	0.12	U	7/30/2012	
PCB-1248	µg/L	0.12	0.12	U	8/6/2012	
PCB-1248	µg/L	0.12	0.12	U	8/13/2012	
PCB-1248	µg/L	0.12	0.12	U	8/20/2012	
PCB-1248	µg/L	0.12	0.12	U	8/27/2012	
PCB-1248	µg/L	0.12	0.12	U	9/4/2012	
PCB-1248	µg/L	0.12	0.12	U	9/10/2012	
PCB-1248	µg/L	0.12	0.12	U	9/17/2012	
PCB-1248	µg/L	0.12	0.12	U	9/24/2012	
PCB-1248	µg/L	0.12	0.12	U	10/1/2012	
PCB-1248	µg/L	0.12	0.12	U	10/8/2012	
PCB-1248	µg/L	0.11	0.11	U	10/15/2012	
PCB-1248	µg/L	0.12	0.12	UY	10/22/2012	
PCB-1248	µg/L	0.12	0.12	U	10/29/2012	
PCB-1248	µg/L	0.12	0.12	U	11/5/2012	
PCB-1248	µg/L	0.12	0.12	UY	11/13/2012	Duplicate
PCB-1248	µg/L	0.12	0.12	UY	11/13/2012	
PCB-1248	µg/L	0.12	0.12	U	11/19/2012	
PCB-1248	µg/L	0.12	0.12	U	11/26/2012	
PCB-1248	µg/L	0.11	0.11	UY	12/3/2012	
PCB-1248	µg/L	0.12	0.12	U	12/10/2012	
PCB-1248	µg/L	0.12	0.12	U	12/17/2012	
PCB-1248	µg/L	0.12	0.12	U	12/27/2012	
PCB-1254	µg/L	0.07	0.07	U	1/3/2012	
PCB-1254	µg/L	0.07	0.07	U	1/9/2012	
PCB-1254	µg/L	0.07	0.07	U	1/17/2012	
PCB-1254	µg/L	0.07	0.07	U	1/23/2012	
PCB-1254	µg/L	0.07	0.07	U	1/30/2012	
PCB-1254	µg/L	0.07	0.07	U	2/6/2012	
PCB-1254	µg/L	0.07	0.07	U	2/13/2012	
PCB-1254	µg/L	0.07	0.07	UX	2/20/2012	
PCB-1254	µg/L	0.07	0.07	UY	2/27/2012	
PCB-1254	µg/L	0.07	0.07	U	3/5/2012	
PCB-1254	µg/L	0.07	0.07	U	3/12/2012	
PCB-1254	µg/L	0.07	0.07	U	3/19/2012	
PCB-1254	µg/L	0.07	0.07	UY	3/26/2012	
PCB-1254	µg/L	0.07	0.07	U	4/3/2012	
PCB-1254	µg/L	0.07	0.07	U	4/9/2012	
PCB-1254	µg/L	0.07	0.07	U	4/16/2012	

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Table C.3.1. Nonradiological Effluent Data for Outfall 001 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
PCB-1254	µg/L	0.07	0.07	U	4/24/2012	
PCB-1254	µg/L	0.07	0.07	U	5/1/2012	Duplicate
PCB-1254	µg/L	0.07	0.07	U	5/1/2012	
PCB-1254	µg/L	0.07	0.07	U	5/7/2012	
PCB-1254	µg/L	0.07	0.07	U	5/14/2012	
PCB-1254	µg/L	0.07	0.07	UY	5/21/2012	
PCB-1254	µg/L	0.07	0.07	U	5/29/2012	
PCB-1254	µg/L	0.07	0.07	U	6/4/2012	
PCB-1254	µg/L	0.07	0.07	U	6/11/2012	
PCB-1254	µg/L	0.07	0.07	UX	6/18/2012	
PCB-1254	µg/L	0.07	0.07	U	6/25/2012	
PCB-1254	µg/L	0.07	0.07	U	7/2/2012	
PCB-1254	µg/L	0.07	0.07	U	7/9/2012	
PCB-1254	µg/L	0.07	0.07	U	7/16/2012	
PCB-1254	µg/L	0.07	0.07	U	7/23/2012	
PCB-1254	µg/L	0.07	0.07	U	7/30/2012	
PCB-1254	µg/L	0.07	0.07	U	8/6/2012	
PCB-1254	µg/L	0.07	0.07	U	8/13/2012	
PCB-1254	µg/L	0.07	0.07	U	8/20/2012	
PCB-1254	µg/L	0.07	0.07	U	8/27/2012	
PCB-1254	µg/L	0.07	0.07	U	9/4/2012	
PCB-1254	µg/L	0.07	0.07	U	9/10/2012	
PCB-1254	µg/L	0.07	0.07	U	9/17/2012	
PCB-1254	µg/L	0.07	0.07	U	9/24/2012	
PCB-1254	µg/L	0.07	0.07	U	10/1/2012	
PCB-1254	µg/L	0.07	0.07	U	10/8/2012	
PCB-1254	µg/L	0.07	0.07	U	10/15/2012	
PCB-1254	µg/L	0.07	0.07	UY	10/22/2012	
PCB-1254	µg/L	0.07	0.07	U	10/29/2012	
PCB-1254	µg/L	0.07	0.07	U	11/5/2012	
PCB-1254	µg/L	0.07	0.07	UY	11/13/2012	
PCB-1254	µg/L	0.07	0.07	UY	11/13/2012	Duplicate
PCB-1254	µg/L	0.07	0.07	U	11/19/2012	
PCB-1254	µg/L	0.07	0.07	U	11/26/2012	
PCB-1254	µg/L	0.07	0.07	UY	12/3/2012	
PCB-1254	µg/L	0.07	0.07	U	12/10/2012	
PCB-1254	µg/L	0.07	0.07	U	12/17/2012	
PCB-1254	µg/L	0.07	0.07	U	12/27/2012	
PCB-1260	µg/L	0.05	0.05	U	1/3/2012	
PCB-1260	µg/L	0.05	0.05	U	1/9/2012	
PCB-1260	µg/L	0.05	0.05	U	1/17/2012	
PCB-1260	µg/L	0.05	0.05	UY	1/23/2012	
PCB-1260	µg/L	0.05	0.05	U	1/30/2012	
PCB-1260	µg/L	0.05	0.05	UY	2/6/2012	
PCB-1260	µg/L	0.05	0.05	U	2/13/2012	
PCB-1260	µg/L	0.05	0.05	UXY	2/20/2012	
PCB-1260	µg/L	0.05	0.05	UY	2/27/2012	
PCB-1260	µg/L	0.05	0.05	U	3/5/2012	
PCB-1260	µg/L	0.05	0.05	U	3/12/2012	

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Table C.3.1. Nonradiological Effluent Data for Outfall 001 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
PCB-1260	µg/L	0.05	0.05	U	3/19/2012	
PCB-1260	µg/L	0.05	0.05	UY	3/26/2012	
PCB-1260	µg/L	0.05	0.05	U	4/3/2012	
PCB-1260	µg/L	0.05	0.05	U	4/9/2012	
PCB-1260	µg/L	0.05	0.05	U	4/16/2012	
PCB-1260	µg/L	0.05	0.05	U	4/24/2012	
PCB-1260	µg/L	0.05	0.05	U	5/1/2012	
PCB-1260	µg/L	0.08	0.05		5/1/2012	Duplicate
PCB-1260	µg/L	0.05	0.05	U	5/7/2012	
PCB-1260	µg/L	0.05	0.05	U	5/14/2012	
PCB-1260	µg/L	0.05	0.05	UY	5/21/2012	
PCB-1260	µg/L	0.05	0.05	U	5/29/2012	
PCB-1260	µg/L	0.05	0.05	U	6/4/2012	
PCB-1260	µg/L	0.05	0.05	U	6/11/2012	
PCB-1260	µg/L	0.05	0.05	UX	6/18/2012	
PCB-1260	µg/L	0.05	0.05	U	6/25/2012	
PCB-1260	µg/L	0.05	0.05	UJ	7/2/2012	
PCB-1260	µg/L	0.05	0.05	U	7/9/2012	
PCB-1260	µg/L	0.05	0.05	U	7/16/2012	
PCB-1260	µg/L	0.05	0.05	U	7/23/2012	
PCB-1260	µg/L	0.05	0.05	U	7/30/2012	
PCB-1260	µg/L	0.05	0.05	U	8/6/2012	
PCB-1260	µg/L	0.05	0.05	U	8/13/2012	
PCB-1260	µg/L	0.05	0.05	U	8/20/2012	
PCB-1260	µg/L	0.05	0.05	U	8/27/2012	
PCB-1260	µg/L	0.05	0.05	U	9/4/2012	
PCB-1260	µg/L	0.05	0.05	U	9/10/2012	
PCB-1260	µg/L	0.05	0.05	U	9/17/2012	
PCB-1260	µg/L	0.05	0.05	U	9/24/2012	
PCB-1260	µg/L	0.05	0.05	U	10/1/2012	
PCB-1260	µg/L	0.05	0.05	U	10/8/2012	
PCB-1260	µg/L	0.05	0.05	UJ	10/15/2012	
PCB-1260	µg/L	0.05	0.05	UY	10/22/2012	
PCB-1260	µg/L	0.05	0.05	U	10/29/2012	
PCB-1260	µg/L	0.05	0.05	UJ	11/5/2012	
PCB-1260	µg/L	0.05	0.05	UY	11/13/2012	
PCB-1260	µg/L	0.05	0.05	UY	11/13/2012	Duplicate
PCB-1260	µg/L	0.05	0.05	U	11/19/2012	
PCB-1260	µg/L	0.05	0.05	U	11/26/2012	
PCB-1260	µg/L	0.05	0.05	UY	12/3/2012	
PCB-1260	µg/L	0.05	0.05	UJ	12/10/2012	
PCB-1260	µg/L	0.05	0.05	U	12/17/2012	
PCB-1260	µg/L	0.05	0.05	UJ	12/27/2012	
PCB-1268	µg/L	0.09	0.09	U	1/3/2012	
PCB-1268	µg/L	0.09	0.09	U	1/9/2012	
PCB-1268	µg/L	0.09	0.09	U	1/17/2012	
PCB-1268	µg/L	0.09	0.09	U	1/23/2012	
PCB-1268	µg/L	0.09	0.09	U	1/30/2012	
PCB-1268	µg/L	0.09	0.09	U	2/6/2012	

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Table C.3.1. Nonradiological Effluent Data for Outfall 001 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
PCB-1268	µg/L	0.09	0.09	U	2/13/2012	
PCB-1268	µg/L	0.09	0.09	UX	2/20/2012	
PCB-1268	µg/L	0.09	0.09	UY	2/27/2012	
PCB-1268	µg/L	0.09	0.09	U	3/5/2012	
PCB-1268	µg/L	0.09	0.09	U	3/12/2012	
PCB-1268	µg/L	0.09	0.09	U	3/19/2012	
PCB-1268	µg/L	0.09	0.09	UY	3/26/2012	
PCB-1268	µg/L	0.09	0.09	U	4/3/2012	
PCB-1268	µg/L	0.09	0.09	U	4/9/2012	
PCB-1268	µg/L	0.09	0.09	U	4/16/2012	
PCB-1268	µg/L	0.09	0.09	U	4/24/2012	
PCB-1268	µg/L	0.09	0.09	U	5/1/2012	Duplicate
PCB-1268	µg/L	0.09	0.09	U	5/1/2012	
PCB-1268	µg/L	0.09	0.09	U	5/7/2012	
PCB-1268	µg/L	0.09	0.09	U	5/14/2012	
PCB-1268	µg/L	0.09	0.09	UY	5/21/2012	
PCB-1268	µg/L	0.09	0.09	U	5/29/2012	
PCB-1268	µg/L	0.09	0.09	U	6/4/2012	
PCB-1268	µg/L	0.09	0.09	U	6/11/2012	
PCB-1268	µg/L	0.09	0.09	UX	6/18/2012	
PCB-1268	µg/L	0.09	0.09	U	6/25/2012	
PCB-1268	µg/L	0.09	0.09	U	7/2/2012	
PCB-1268	µg/L	0.09	0.09	U	7/9/2012	
PCB-1268	µg/L	0.09	0.09	U	7/16/2012	
PCB-1268	µg/L	0.09	0.09	U	7/23/2012	
PCB-1268	µg/L	0.09	0.09	U	7/30/2012	
PCB-1268	µg/L	0.09	0.09	U	8/6/2012	
PCB-1268	µg/L	0.09	0.09	U	8/13/2012	
PCB-1268	µg/L	0.09	0.09	U	8/20/2012	
PCB-1268	µg/L	0.09	0.09	U	8/27/2012	
PCB-1268	µg/L	0.09	0.09	U	9/4/2012	
PCB-1268	µg/L	0.09	0.09	U	9/10/2012	
PCB-1268	µg/L	0.09	0.09	U	9/17/2012	
PCB-1268	µg/L	0.09	0.09	U	9/24/2012	
PCB-1268	µg/L	0.09	0.09	U	10/1/2012	
PCB-1268	µg/L	0.09	0.09	U	10/8/2012	
PCB-1268	µg/L	0.09	0.09	U	10/15/2012	
PCB-1268	µg/L	0.09	0.09	UY	10/22/2012	
PCB-1268	µg/L	0.09	0.09	U	10/29/2012	
PCB-1268	µg/L	0.09	0.09	U	11/5/2012	
PCB-1268	µg/L	0.09	0.09	UY	11/13/2012	
PCB-1268	µg/L	0.09	0.09	UY	11/13/2012	Duplicate
PCB-1268	µg/L	0.09	0.09	U	11/19/2012	
PCB-1268	µg/L	0.09	0.09	U	11/26/2012	
PCB-1268	µg/L	0.09	0.09	UY	12/3/2012	
PCB-1268	µg/L	0.09	0.09	U	12/10/2012	
PCB-1268	µg/L	0.09	0.09	U	12/17/2012	
PCB-1268	µg/L	0.09	0.09	U	12/27/2012	
pH	Std Unit	7.73			1/3/2012	

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Table C.3.1. Nonradiological Effluent Data for Outfall 001 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
pH	Std Unit	7.57			1/9/2012
pH	Std Unit	8.09			1/11/2012
pH	Std Unit	7.66			1/13/2012
pH	Std Unit	6.53			1/17/2012
pH	Std Unit	7.33			1/23/2012
pH	Std Unit	7.44			1/30/2012
pH	Std Unit	7.92			2/6/2012
pH	Std Unit	6.33			2/13/2012
pH	Std Unit	6.95			2/20/2012
pH	Std Unit	7.73			2/27/2012
pH	Std Unit	7.67			3/5/2012
pH	Std Unit	8.1			3/12/2012
pH	Std Unit	7.28			3/19/2012
pH	Std Unit	7.33			3/26/2012
pH	Std Unit	7.98			4/3/2012
pH	Std Unit	7.52			4/9/2012
pH	Std Unit	7.42			4/16/2012
pH	Std Unit	6.17			4/18/2012
pH	Std Unit	8.07			4/18/2012
pH	Std Unit	7.28			4/20/2012
pH	Std Unit	6.94			4/24/2012
pH	Std Unit	8.75			5/1/2012
pH	Std Unit	7.52			5/2/2012
pH	Std Unit	7.65			5/7/2012
pH	Std Unit	7.36			5/14/2012
pH	Std Unit	7.6			5/21/2012
pH	Std Unit	7.75			5/29/2012
pH	Std Unit	7.27			6/4/2012
pH	Std Unit	7.45			6/11/2012
pH	Std Unit	7.34			6/18/2012
pH	Std Unit	7.1			6/25/2012
pH	Std Unit	7.5			7/2/2012
pH	Std Unit	7.27			7/9/2012
pH	Std Unit	7.34			7/16/2012
pH	Std Unit	7.3			7/23/2012
pH	Std Unit	6.82			7/30/2012
pH	Std Unit	6.47			8/6/2012
pH	Std Unit	7.39			8/13/2012
pH	Std Unit	6.76			8/20/2012
pH	Std Unit	7.2			8/22/2012
pH	Std Unit	6.88			8/24/2012
pH	Std Unit	7.68			8/27/2012
pH	Std Unit	6.87			9/4/2012
pH	Std Unit	7.57			9/10/2012
pH	Std Unit	7.16			9/17/2012
pH	Std Unit	7.33			9/24/2012
pH	Std Unit	6.23			10/1/2012
pH	Std Unit	6.55			10/8/2012
pH	Std Unit	7.21			10/15/2012

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Table C.3.1. Nonradiological Effluent Data for Outfall 001 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
pH	Std Unit	7.31			10/17/2012	
pH	Std Unit	7.48			10/19/2012	
pH	Std Unit	7.13			10/22/2012	
pH	Std Unit	7.08			10/29/2012	
pH	Std Unit	7.9			11/5/2012	
pH	Std Unit	7.36			11/13/2012	
pH	Std Unit	7.99			11/19/2012	
pH	Std Unit	7.44			11/26/2012	
pH	Std Unit	7.15			12/3/2012	
pH	Std Unit	7.42			12/10/2012	
pH	Std Unit	8.41			12/17/2012	
pH	Std Unit	7.36			12/27/2012	
Phosphorous	mg/L	0.26	0.05		1/3/2012	
Phosphorous	mg/L	0.32	0.05		1/9/2012	
Phosphorous	mg/L	0.34	0.05		1/17/2012	
Phosphorous	mg/L	0.33	0.05		1/23/2012	
Phosphorous	mg/L	0.27	0.05		1/30/2012	
Phosphorous	mg/L	0.26	0.05		2/6/2012	
Phosphorous	mg/L	0.28	0.05		2/13/2012	
Phosphorous	mg/L	0.29	0.05		2/20/2012	
Phosphorous	mg/L	0.36	0.05		2/27/2012	
Phosphorous	mg/L	0.32	0.05		3/5/2012	
Phosphorous	mg/L	0.27	0.1		3/12/2012	
Phosphorous	mg/L	0.29	0.05		3/19/2012	
Phosphorous	mg/L	0.29	0.05		3/26/2012	
Phosphorous	mg/L	0.39	0.11		4/3/2012	
Phosphorous	mg/L	0.36	0.05		4/9/2012	
Phosphorous	mg/L	0.45	0.1	N	4/16/2012	
Phosphorous	mg/L	0.31	0.05		4/24/2012	
Phosphorous	mg/L	0.33	0.05		5/1/2012	Duplicate
Phosphorous	mg/L	0.33	0.11		5/1/2012	
Phosphorous	mg/L	0.29	0.05		5/7/2012	
Phosphorous	mg/L	0.25	0.05		5/14/2012	
Phosphorous	mg/L	0.36	0.05		5/21/2012	
Phosphorous	mg/L	0.27	0.05		5/29/2012	
Phosphorous	mg/L	0.31	0.05		6/4/2012	
Phosphorous	mg/L	0.28	0.05		6/11/2012	
Phosphorous	mg/L	0.27	0.05		6/18/2012	
Phosphorous	mg/L	0.25	0.05		6/25/2012	
Phosphorous	mg/L	0.31	0.05		7/2/2012	
Phosphorous	mg/L	0.47	0.04		7/9/2012	
Phosphorous	mg/L	0.37	0.04		7/16/2012	
Phosphorous	mg/L	0.43	0.04		7/23/2012	
Phosphorous	mg/L	0.5	0.04		7/30/2012	
Phosphorous	mg/L	0.63	0.04		8/6/2012	
Phosphorous	mg/L	0.53	0.04		8/13/2012	
Phosphorous	mg/L	0.49	0.04		8/20/2012	
Phosphorous	mg/L	0.49	0.04		8/27/2012	
Phosphorous	mg/L	0.5	0.04		9/4/2012	

KPDES Outfall Nonradiological Data

Table C.3.1. Nonradiological Effluent Data for Outfall 001 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
Phosphorous	mg/L	0.25	0.04		9/10/2012	
Phosphorous	mg/L	0.34	0.04		9/17/2012	
Phosphorous	mg/L	0.2	0.04		9/24/2012	
Phosphorous	mg/L	0.24	0.04		10/1/2012	
Phosphorous	mg/L	0.17	0.04		10/8/2012	
Phosphorous	mg/L	0.2	0.04		10/15/2012	
Phosphorous	mg/L	0.16	0.04		10/22/2012	
Phosphorous	mg/L	0.18	0.04		10/29/2012	
Phosphorous	mg/L	0.35	0.08		11/5/2012	
Phosphorous	mg/L	0.21	0.04		11/13/2012	Duplicate
Phosphorous	mg/L	0.23	0.04		11/13/2012	
Phosphorous	mg/L	0.26	0.04		11/19/2012	
Phosphorous	mg/L	0.24	0.04		11/26/2012	
Phosphorous	mg/L	0.26	0.04		12/3/2012	
Phosphorous	mg/L	0.2	0.04		12/10/2012	
Phosphorous	mg/L	0.24	0.04		12/17/2012	
Phosphorous	mg/L	0.21	0.04		12/27/2012	
PCB, Total	µg/L	0.18	0.18	U	1/3/2012	
PCB, Total	µg/L	0.18	0.18	U	1/9/2012	
PCB, Total	µg/L	0.18	0.18	U	1/17/2012	
PCB, Total	µg/L	0.18	0.18	U	1/23/2012	
PCB, Total	µg/L	0.18	0.18	U	1/30/2012	
PCB, Total	µg/L	0.18	0.18	U	2/6/2012	
PCB, Total	µg/L	0.18	0.18	U	2/13/2012	
PCB, Total	µg/L	0.18	0.18	UX	2/20/2012	
PCB, Total	µg/L	0.18	0.18	UY	2/27/2012	
PCB, Total	µg/L	0.18	0.18	U	3/5/2012	
PCB, Total	µg/L	0.18	0.18	U	3/12/2012	
PCB, Total	µg/L	0.18	0.18	U	3/19/2012	
PCB, Total	µg/L	0.18	0.18	UY	3/26/2012	
PCB, Total	µg/L	0.18	0.18	U	4/3/2012	
PCB, Total	µg/L	0.18	0.18	U	4/9/2012	
PCB, Total	µg/L	0.18	0.18	U	4/16/2012	
PCB, Total	µg/L	0.18	0.18	U	4/24/2012	
PCB, Total	µg/L	0.18	0.18	U	5/1/2012	
PCB, Total	µg/L	0.18	0.18	U	5/1/2012	Duplicate
PCB, Total	µg/L	0.18	0.18	U	5/7/2012	
PCB, Total	µg/L	0.18	0.18	U	5/14/2012	
PCB, Total	µg/L	0.18	0.18	UY	5/21/2012	
PCB, Total	µg/L	0.19	0.19	U	5/29/2012	
PCB, Total	µg/L	0.18	0.18	U	6/4/2012	
PCB, Total	µg/L	0.18	0.18	U	6/11/2012	
PCB, Total	µg/L	0.18	0.18	UX	6/18/2012	
PCB, Total	µg/L	0.18	0.18	U	6/25/2012	
PCB, Total	µg/L	0.18	0.18	U	7/2/2012	
PCB, Total	µg/L	0.18	0.18	U	7/9/2012	
PCB, Total	µg/L	0.18	0.18	U	7/16/2012	
PCB, Total	µg/L	0.18	0.18	U	7/23/2012	
PCB, Total	µg/L	0.18	0.18	U	7/30/2012	

KPDES Outfall Nonradiological Data

Table C.3.1. Nonradiological Effluent Data for Outfall 001 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
PCB, Total	µg/L	0.18	0.18	U	8/6/2012	
PCB, Total	µg/L	0.17	0.17	U	8/13/2012	
PCB, Total	µg/L	0.18	0.18	U	8/20/2012	
PCB, Total	µg/L	0.17	0.17	U	8/27/2012	
PCB, Total	µg/L	0.17	0.17	U	9/4/2012	
PCB, Total	µg/L	0.18	0.18	U	9/10/2012	
PCB, Total	µg/L	0.18	0.18	U	9/17/2012	
PCB, Total	µg/L	0.17	0.17	U	9/24/2012	
PCB, Total	µg/L	0.18	0.18	U	10/1/2012	
PCB, Total	µg/L	0.17	0.17	U	10/8/2012	
PCB, Total	µg/L	0.17	0.17	U	10/15/2012	
PCB, Total	µg/L	0.18	0.18	UY	10/22/2012	
PCB, Total	µg/L	0.18	0.18	U	10/29/2012	
PCB, Total	µg/L	0.18	0.18	U	11/5/2012	
PCB, Total	µg/L	0.18	0.18	UY	11/13/2012	Duplicate
PCB, Total	µg/L	0.18	0.18	UY	11/13/2012	
PCB, Total	µg/L	0.18	0.18	U	11/19/2012	
PCB, Total	µg/L	0.17	0.17	U	11/26/2012	
PCB, Total	µg/L	0.17	0.17	UY	12/3/2012	
PCB, Total	µg/L	0.17	0.17	U	12/10/2012	
PCB, Total	µg/L	0.18	0.18	U	12/17/2012	
PCB, Total	µg/L	0.18	0.18	U	12/27/2012	
SEM	%				4/9/2012	
SEM	%				5/1/2012	
SEM	%				5/1/2012	Duplicate
Suspended Solids	mg/L	16	16	U	1/3/2012	
Suspended Solids	mg/L	16	16	U	1/9/2012	
Suspended Solids	mg/L	16	16	U	1/17/2012	
Suspended Solids	mg/L	20	16		1/23/2012	
Suspended Solids	mg/L	16	16	U	1/30/2012	
Suspended Solids	mg/L	16	16	U	2/6/2012	
Suspended Solids	mg/L	16	16	U	2/13/2012	
Suspended Solids	mg/L	16	16	U	2/20/2012	
Suspended Solids	mg/L	16	16	U	2/27/2012	
Suspended Solids	mg/L	16	16	U	3/5/2012	
Suspended Solids	mg/L	16	16	U	3/12/2012	
Suspended Solids	mg/L	22	16		3/19/2012	
Suspended Solids	mg/L	24	16		3/26/2012	
Suspended Solids	mg/L	31	16		4/3/2012	
Suspended Solids	mg/L	36	16		4/9/2012	
Suspended Solids	mg/L	31	16		4/16/2012	
Suspended Solids	mg/L	20	16		4/18/2012	
Suspended Solids	mg/L	23	16		4/24/2012	
Suspended Solids	mg/L	69	11		5/1/2012	
Suspended Solids	mg/L	73	11		5/1/2012	Duplicate
Suspended Solids	mg/L	24	11		5/2/2012	
Suspended Solids	mg/L	28	16		5/7/2012	
Suspended Solids	mg/L	30	16		5/14/2012	
Suspended Solids	mg/L	47	16		5/21/2012	

KPDES Outfall Nonradiological Data

Table C.3.1. Nonradiological Effluent Data for Outfall 001 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
Suspended Solids	mg/L	26	16		5/29/2012	
Suspended Solids	mg/L	18	16		6/4/2012	
Suspended Solids	mg/L	16	16	U	6/11/2012	
Suspended Solids	mg/L	26	16		6/18/2012	
Suspended Solids	mg/L	19	16		6/25/2012	
Suspended Solids	mg/L	26	11		7/2/2012	
Suspended Solids	mg/L	24	20		7/9/2012	
Suspended Solids	mg/L	18	16		7/16/2012	
Suspended Solids	mg/L	16	16	U	7/23/2012	
Suspended Solids	mg/L	16	16		7/30/2012	
Suspended Solids	mg/L	16	16	U	8/6/2012	
Suspended Solids	mg/L	16	16	U	8/13/2012	
Suspended Solids	mg/L	16	16	U	8/20/2012	
Suspended Solids	mg/L	16	16	U	8/27/2012	
Suspended Solids	mg/L	16	16	U	9/4/2012	
Suspended Solids	mg/L	16	16	U	9/10/2012	
Suspended Solids	mg/L	16	16	U	9/17/2012	
Suspended Solids	mg/L	16	16	U	9/24/2012	
Suspended Solids	mg/L	30	16		10/1/2012	
Suspended Solids	mg/L	10	10		10/8/2012	
Suspended Solids	mg/L	7	4		10/15/2012	
Suspended Solids	mg/L	10	10	U	10/22/2012	
Suspended Solids	mg/L	10	10	U	10/29/2012	
Suspended Solids	mg/L	10	10	U	11/5/2012	
Suspended Solids	mg/L	10	10	U	11/13/2012	Duplicate
Suspended Solids	mg/L	10	10	U	11/13/2012	
Suspended Solids	mg/L	15	10		11/19/2012	
Suspended Solids	mg/L	10	10	U	11/26/2012	
Suspended Solids	mg/L	10	10	U	12/3/2012	
Suspended Solids	mg/L	23	16		12/10/2012	
Suspended Solids	mg/L	16	16	U	12/17/2012	
Suspended Solids	mg/L	10	10	U	12/27/2012	
Temperature	deg F	48.8			1/3/2012	
Temperature	deg F	52.3			1/9/2012	
Temperature	deg F	52.2			1/11/2012	
Temperature	deg F	48.7			1/13/2012	
Temperature	deg F	55.6			1/17/2012	
Temperature	deg F	52.6			1/23/2012	
Temperature	deg F	52			1/30/2012	
Temperature	deg F	52.7			2/6/2012	
Temperature	deg F	50.5			2/13/2012	
Temperature	deg F	52.2			2/20/2012	
Temperature	deg F	54.9			2/27/2012	
Temperature	deg F	56.1			3/5/2012	
Temperature	deg F	60.4			3/12/2012	
Temperature	deg F	68.1			3/19/2012	
Temperature	deg F	64.6			3/26/2012	
Temperature	deg F	74.5			4/3/2012	
Temperature	deg F	65.8			4/9/2012	

KPDES Outfall Nonradiological Data

Table C.3.1. Nonradiological Effluent Data for Outfall 001 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
Temperature	deg F	67.1			4/16/2012
Temperature	deg F	73.7			4/18/2012
Temperature	deg F	64.9			4/18/2012
Temperature	deg F	67.7			4/20/2012
Temperature	deg F	64.2			4/24/2012
Temperature	deg F	77.9			5/1/2012
Temperature	deg F	79.5			5/2/2012
Temperature	deg F	75.9			5/7/2012
Temperature	deg F	71.6			5/14/2012
Temperature	deg F	78.3			5/21/2012
Temperature	deg F	78.6			5/29/2012
Temperature	deg F	72.6			6/4/2012
Temperature	deg F	74.7			6/11/2012
Temperature	deg F	75.3			6/18/2012
Temperature	deg F	77.5			6/25/2012
Temperature	deg F	79.8			7/2/2012
Temperature	deg F	80.5			7/9/2012
Temperature	deg F	78.6			7/16/2012
Temperature	deg F	77.4			7/23/2012
Temperature	deg F	77.6			7/30/2012
Temperature	deg F	79.5			8/6/2012
Temperature	deg F	74.7			8/13/2012
Temperature	deg F	70.5			8/20/2012
Temperature	deg F	73.4			8/22/2012
Temperature	deg F	74.1			8/24/2012
Temperature	deg F	76.5			8/27/2012
Temperature	deg F	75			9/4/2012
Temperature	deg F	71.1			9/10/2012
Temperature	deg F	74.1			9/17/2012
Temperature	deg F	67.6			9/24/2012
Temperature	deg F	70.3			10/1/2012
Temperature	deg F	64.7			10/8/2012
Temperature	deg F	64.9			10/15/2012
Temperature	deg F	66.1			10/17/2012
Temperature	deg F	63			10/19/2012
Temperature	deg F	64.1			10/22/2012
Temperature	deg F	60			10/29/2012
Temperature	deg F	60			11/5/2012
Temperature	deg F	56.3			11/13/2012
Temperature	deg F	57			11/19/2012
Temperature	deg F	56			11/26/2012
Temperature	deg F	59.3			12/3/2012
Temperature	deg F	58.5			12/10/2012
Temperature	deg F	58.4			12/17/2012
Temperature	deg F	46.3			12/27/2012
Trichloroethene	µg/L	1	1	UYJ	1/3/2012
Trichloroethene	µg/L	1	1	UXJ	1/9/2012
Trichloroethene	µg/L	1	1	UJY	1/17/2012
Trichloroethene	µg/L	1	1	U	1/23/2012

KPDES Outfall Nonradiological Data

Table C.3.1. Nonradiological Effluent Data for Outfall 001 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
Trichloroethene	µg/L	1	1	U	1/30/2012	
Trichloroethene	µg/L	1	1	U	2/6/2012	
Trichloroethene	µg/L	1	1	UX	2/13/2012	
Trichloroethene	µg/L	1	1	UX	2/20/2012	
Trichloroethene	µg/L	1	1	UX	2/27/2012	
Trichloroethene	µg/L	1	1	U	3/5/2012	
Trichloroethene	µg/L	1	1	UJ	3/12/2012	
Trichloroethene	µg/L	1	1	UX	3/19/2012	
Trichloroethene	µg/L	1	1	UJY	3/26/2012	
Trichloroethene	µg/L	1	1	U	4/3/2012	
Trichloroethene	µg/L	1	1	UJ	4/9/2012	
Trichloroethene	µg/L	1	1	UX	4/16/2012	
Trichloroethene	µg/L	1	1	UJ	4/24/2012	
Trichloroethene	µg/L	1	1	UJ	5/1/2012	Duplicate
Trichloroethene	µg/L	1	1	UJ	5/1/2012	
Trichloroethene	µg/L	1	1	U	5/7/2012	
Trichloroethene	µg/L	1	1	U	5/14/2012	
Trichloroethene	µg/L	1	1	U	5/21/2012	
Trichloroethene	µg/L	1	1	U	5/29/2012	
Trichloroethene	µg/L	1	1	U	6/4/2012	
Trichloroethene	µg/L	1	1	U	6/11/2012	
Trichloroethene	µg/L	1	1	U	6/18/2012	
Trichloroethene	µg/L	1	1	U	6/25/2012	
Trichloroethene	µg/L	1	1	U	7/2/2012	
Trichloroethene	µg/L	1	1	UY	7/9/2012	
Trichloroethene	µg/L	1	1	U	7/16/2012	
Trichloroethene	µg/L	1	1	U	7/23/2012	
Trichloroethene	µg/L	1	1	UY	7/30/2012	
Trichloroethene	µg/L	1	1	UJ	8/6/2012	
Trichloroethene	µg/L	1	1	UJY	8/13/2012	
Trichloroethene	µg/L	1	1	UJY	8/20/2012	
Trichloroethene	µg/L	1	1	UJY	8/27/2012	
Trichloroethene	µg/L	1	1	UJY	9/4/2012	
Trichloroethene	µg/L	1	1	UJY	9/10/2012	
Trichloroethene	µg/L	1	1	U	9/17/2012	
Trichloroethene	µg/L	1	1	U	9/24/2012	
Trichloroethene	µg/L	1	1	UJ	10/1/2012	
Trichloroethene	µg/L	1	1	U	10/8/2012	
Trichloroethene	µg/L	1	1	UJ	10/15/2012	
Trichloroethene	µg/L	1	1	U	10/22/2012	
Trichloroethene	µg/L	1	1	U	10/29/2012	
Trichloroethene	µg/L	1	1	U	11/5/2012	
Trichloroethene	µg/L	1	1	U	11/13/2012	
Trichloroethene	µg/L	1	1	U	11/13/2012	Duplicate
Trichloroethene	µg/L	1	1	UJ	11/19/2012	
Trichloroethene	µg/L	1	1	UY	11/26/2012	
Trichloroethene	µg/L	1	1	U	12/3/2012	
Trichloroethene	µg/L	1	1	U	12/10/2012	
Trichloroethene	µg/L	1	1	U	12/17/2012	

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Table C.3.1. Nonradiological Effluent Data for Outfall 001 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
Trichloroethene	µg/L	1	1	U	12/27/2012	
Uranium	mg/L	0.0035	0.001	B	1/3/2012	
Uranium	mg/L	0.0035	0.001	B	1/9/2012	
Uranium	mg/L	0.0048	0.001		1/17/2012	
Uranium	mg/L	0.0406	0.001		1/23/2012	
Uranium	mg/L	0.0097	0.001		1/30/2012	
Uranium	mg/L	0.025	0.001		2/6/2012	
Uranium	mg/L	0.0027	0.001		2/13/2012	
Uranium	mg/L	0.0044	0.001		2/20/2012	
Uranium	mg/L	0.0021	0.001		2/27/2012	
Uranium	mg/L	0.002	0.001		3/5/2012	
Uranium	mg/L	0.0073	0.001		3/12/2012	
Uranium	mg/L	0.0045	0.001		3/19/2012	
Uranium	mg/L	0.0067	0.001		3/26/2012	
Uranium	mg/L	0.0026	0.001		4/3/2012	
Uranium	mg/L	0.0023	0.001		4/9/2012	
Uranium	mg/L	0.0049	0.001	B	4/16/2012	
Uranium	mg/L	0.0015	0.001	B	4/24/2012	
Uranium	mg/L	0.004	0.001		5/1/2012	Duplicate
Uranium	mg/L	0.0039	0.001		5/1/2012	
Uranium	mg/L	0.0012	0.001		5/7/2012	
Uranium	mg/L	0.0013	0.001		5/14/2012	
Uranium	mg/L	0.0017	0.001		5/21/2012	
Uranium	mg/L	0.001	0.001	UB	5/29/2012	
Uranium	mg/L	0.001	0.001		6/4/2012	
Uranium	mg/L	0.001	0.001	U	6/11/2012	
Uranium	mg/L	0.001	0.001	U	6/18/2012	
Uranium	mg/L	0.0012	0.001		6/25/2012	
Uranium	mg/L	0.0012	0.001		7/2/2012	
Uranium	mg/L	0.0012	0.001		7/9/2012	
Uranium	mg/L	0.001	0.001		7/16/2012	
Uranium	mg/L	0.001	0.001	U	7/23/2012	
Uranium	mg/L	0.001	0.001	U	7/30/2012	
Uranium	mg/L	0.001	0.001	U	8/6/2012	
Uranium	mg/L	0.0012	0.001		8/13/2012	
Uranium	mg/L	0.0011	0.001		8/20/2012	
Uranium	mg/L	0.001	0.001	U	8/27/2012	
Uranium	mg/L	0.003	0.001		9/4/2012	
Uranium	mg/L	0.0027	0.001		9/10/2012	
Uranium	mg/L	0.0134	0.001		9/17/2012	
Uranium	mg/L	0.001	0.001	U	9/24/2012	
Uranium	mg/L	0.0017	0.001		10/1/2012	
Uranium	mg/L	0.0011	0.001		10/8/2012	
Uranium	mg/L	0.0019	0.001		10/15/2012	
Uranium	mg/L	0.0011	0.001		10/22/2012	
Uranium	mg/L	0.0019	0.001		10/29/2012	
Uranium	mg/L	0.001	0.001	U	11/5/2012	
Uranium	mg/L	0.0095	0.001		11/13/2012	
Uranium	mg/L	0.0094	0.001		11/13/2012	Duplicate

KPDES Outfall Nonradiological Data

Table C.3.1. Nonradiological Effluent Data for Outfall 001 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
Uranium	mg/L	0.0011	0.001		11/19/2012
Uranium	mg/L	0.001	0.001	U	11/26/2012
Uranium	mg/L	0.0011	0.001		12/3/2012
Uranium	mg/L	0.0387	0.001		12/10/2012
Uranium	mg/L	0.0043	0.001		12/17/2012
Uranium	mg/L	0.0852	0.001		12/27/2012

KPDES Outfall Nonradiological Data

Table C.3.2. Nonradiological Effluent Data for Outfall 015

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
Benz(a)anthracene	µg/L	0.002	0.002	U	1/11/2012	
Benz(a)anthracene	µg/L	0.002	0.002	U	1/11/2012	Duplicate
Benz(a)anthracene	µg/L	0.002	0.002	U	10/18/2012	
Benzo(k)fluoranthene	µg/L	0.002	0.002	U	1/11/2012	
Benzo(k)fluoranthene	µg/L	0.002	0.002	U	1/11/2012	Duplicate
Benzo(k)fluoranthene	µg/L	0.002	0.002	U	10/18/2012	
Conductivity	µmho/cm	196			1/11/2012	
Conductivity	µmho/cm	325			2/29/2012	
Conductivity	µmho/cm	315			3/8/2012	
Dissolved Oxygen	mg/L	10.56			1/11/2012	
Dissolved Oxygen	mg/L	8.91			2/29/2012	
Dissolved Oxygen	mg/L	10.8			3/8/2012	
Flow Rate	mgd	0.24			1/11/2012	
Flow Rate	mgd	1.325			2/29/2012	
Flow Rate	mgd	0.58			3/8/2012	
Flow Rate	mgd	0.1512			10/18/2012	
Flow Rate	mgd	0.1512			11/12/2012	
Flow Rate	mgd	0.4007			12/20/2012	
Hardness - Total as CaCO3	mg/L	92	20		1/11/2012	
Hardness - Total as CaCO3	mg/L	90	20		1/11/2012	Duplicate
Hardness - Total as CaCO3	mg/L	130	10		10/18/2012	
Heptachlor	µg/L	0.0005	0.0005	U	1/11/2012	Duplicate
Heptachlor	µg/L	0.0005	0.0005	U	1/11/2012	
Heptachlor	µg/L	0.0005	0.0005	U	10/18/2012	
Iron	mg/L	0.823	0.02		1/11/2012	Duplicate
Iron	mg/L	0.829	0.02		1/11/2012	
Iron	mg/L	0.545	0.01	N	10/18/2012	
Oil and Grease	mg/L	7	7	U	1/11/2012	
Oil and Grease	mg/L	7	7	U	2/29/2012	
Oil and Grease	mg/L	7	7	U	3/8/2012	
Oil and Grease	mg/L	7	7	U	10/18/2012	
Oil and Grease	mg/L	7	7	U	11/12/2012	
Oil and Grease	mg/L	7	7	U	12/20/2012	
Oil and Grease	mg/L	7	7	U	12/20/2012	Duplicate
PCB-1016	µg/L	0.17	0.17	UX	1/11/2012	
PCB-1016	µg/L	0.17	0.17	U	2/29/2012	
PCB-1016	µg/L	0.17	0.17	U	3/8/2012	
PCB-1016	µg/L	0.16	0.16	UY	10/18/2012	
PCB-1016	µg/L	0.16	0.16	UY	11/12/2012	
PCB-1016	µg/L	0.16	0.16	U	12/20/2012	Duplicate
PCB-1016	µg/L	0.16	0.16	U	12/20/2012	
PCB-1221	µg/L	0.18	0.18	UX	1/11/2012	
PCB-1221	µg/L	0.18	0.18	U	2/29/2012	
PCB-1221	µg/L	0.18	0.18	U	3/8/2012	
PCB-1221	µg/L	0.17	0.17	UY	10/18/2012	
PCB-1221	µg/L	0.17	0.17	UY	11/12/2012	
PCB-1221	µg/L	0.17	0.17	U	12/20/2012	Duplicate
PCB-1221	µg/L	0.17	0.17	U	12/20/2012	
PCB-1232	µg/L	0.14	0.14	UX	1/11/2012	

KPDES Outfall Nonradiological Data

Table C.3.2. Nonradiological Effluent Data for Outfall 015 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
PCB-1232	µg/L	0.14	0.14	U	2/29/2012	
PCB-1232	µg/L	0.14	0.14	U	3/8/2012	
PCB-1232	µg/L	0.14	0.14	UY	10/18/2012	
PCB-1232	µg/L	0.14	0.14	UY	11/12/2012	
PCB-1232	µg/L	0.14	0.14	U	12/20/2012	Duplicate
PCB-1232	µg/L	0.14	0.14	U	12/20/2012	
PCB-1242	µg/L	0.1	0.1	UX	1/11/2012	
PCB-1242	µg/L	0.1	0.1	U	2/29/2012	
PCB-1242	µg/L	0.1	0.1	U	3/8/2012	
PCB-1242	µg/L	0.1	0.1	UY	10/18/2012	
PCB-1242	µg/L	0.1	0.1	UY	11/12/2012	
PCB-1242	µg/L	0.1	0.1	U	12/20/2012	
PCB-1242	µg/L	0.1	0.1	U	12/20/2012	Duplicate
PCB-1248	µg/L	0.12	0.12	UX	1/11/2012	
PCB-1248	µg/L	0.12	0.12	U	2/29/2012	
PCB-1248	µg/L	0.12	0.12	U	3/8/2012	
PCB-1248	µg/L	0.12	0.12	UY	10/18/2012	
PCB-1248	µg/L	0.12	0.12	UY	11/12/2012	
PCB-1248	µg/L	0.12	0.12	U	12/20/2012	
PCB-1248	µg/L	0.12	0.12	U	12/20/2012	Duplicate
PCB-1254	µg/L	0.07	0.07	UX	1/11/2012	
PCB-1254	µg/L	0.07	0.07	U	2/29/2012	
PCB-1254	µg/L	0.07	0.07	U	3/8/2012	
PCB-1254	µg/L	0.07	0.07	UY	10/18/2012	
PCB-1254	µg/L	0.07	0.07	UY	11/12/2012	
PCB-1254	µg/L	0.07	0.07	U	12/20/2012	
PCB-1254	µg/L	0.07	0.07	U	12/20/2012	Duplicate
PCB-1260	µg/L	0.05	0.05	UX	1/11/2012	
PCB-1260	µg/L	0.05	0.05	U	2/29/2012	
PCB-1260	µg/L	0.05	0.05	U	3/8/2012	
PCB-1260	µg/L	0.05	0.05	UY	10/18/2012	
PCB-1260	µg/L	0.05	0.05	UY	11/12/2012	
PCB-1260	µg/L	0.05	0.05	U	12/20/2012	Duplicate
PCB-1260	µg/L	0.05	0.05	U	12/20/2012	
PCB-1268	µg/L	0.09	0.09	UX	1/11/2012	
PCB-1268	µg/L	0.09	0.09	U	2/29/2012	
PCB-1268	µg/L	0.09	0.09	U	3/8/2012	
PCB-1268	µg/L	0.09	0.09	UY	10/18/2012	
PCB-1268	µg/L	0.09	0.09	UY	11/12/2012	
PCB-1268	µg/L	0.09	0.09	U	12/20/2012	Duplicate
PCB-1268	µg/L	0.09	0.09	U	12/20/2012	
pH	Std Unit	8.31			1/11/2012	
pH	Std Unit	8.03			2/29/2012	
pH	Std Unit	7.95			3/8/2012	
pH	Std Unit	7.71			10/18/2012	
pH	Std Unit	7.64			11/12/2012	
pH	Std Unit	8.24			12/20/2012	
PCB, Total	µg/L	0.18	0.18	UX	1/11/2012	
PCB, Total	µg/L	0.18	0.18	U	2/29/2012	

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Table C.3.2. Nonradiological Effluent Data for Outfall 015 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
PCB, Total	µg/L	0.18	0.18	U	3/8/2012	
PCB, Total	µg/L	0.17	0.17	UY	10/18/2012	
PCB, Total	µg/L	0.17	0.17	UY	11/12/2012	
PCB, Total	µg/L	0.17	0.17	U	12/20/2012	
PCB, Total	µg/L	0.17	0.17	U	12/20/2012	Duplicate
Suspended Solids	mg/L	24	16		1/11/2012	
Suspended Solids	mg/L	159	27		2/29/2012	
Suspended Solids	mg/L	94	16		3/8/2012	
Suspended Solids	mg/L	14	10	*	10/18/2012	
Suspended Solids	mg/L	11	10		11/12/2012	
Suspended Solids	mg/L	138	16		12/20/2012	Duplicate
Suspended Solids	mg/L	133	16		12/20/2012	
Temperature	deg F	45.4			1/11/2012	
Temperature	deg F	57.5			2/29/2012	
Temperature	deg F	54.8			3/8/2012	
Uranium	mg/L	0.0395	0.001	B	1/11/2012	
Uranium	mg/L	0.118	0.001		2/29/2012	
Uranium	mg/L	0.0441	0.001		3/8/2012	
Uranium	mg/L	0.0306	0.001		10/18/2012	
Uranium	mg/L	0.0272	0.001		11/12/2012	
Uranium	mg/L	0.0323	0.001		12/20/2012	
Uranium	mg/L	0.0325	0.001		12/20/2012	Duplicate

Table C.3.3. Nonradiological Effluent Data for Outfall 017

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
Benz(a)anthracene	µg/L	0.002	0.002	U	1/11/2012	
Benz(a)anthracene	µg/L	0.002	0.002	U	4/16/2012	
Benz(a)anthracene	µg/L	0.002	0.002	U	4/16/2012	Duplicate
Benz(a)anthracene	µg/L	0.002	0.002	U	7/9/2012	
Benz(a)anthracene	µg/L	0.002	0.002	U	10/3/2012	
Conductivity	µmho/cm	505			1/9/2012	
Conductivity	µmho/cm	223			1/11/2012	
Conductivity	µmho/cm	192			1/11/2012	
Conductivity	µmho/cm	341			1/13/2012	
Conductivity	µmho/cm	453			2/13/2012	
Conductivity	µmho/cm	357			2/15/2012	
Conductivity	µmho/cm	518			3/7/2012	
Conductivity	µmho/cm	499			1/9/2012	TRE Sample
Conductivity	µmho/cm	505			1/9/2012	TRE Sample
Conductivity	µmho/cm	223			1/11/2012	TRE Sample
Conductivity	µmho/cm	143			1/25/2012	TRE Sample
Conductivity	µmho/cm	482			1/31/2012	TRE Sample
Conductivity	µmho/cm	515			1/31/2012	TRE Sample
Conductivity	µmho/cm	442			2/13/2012	TRE Sample
Conductivity	µmho/cm	453			2/13/2012	TRE Sample
Conductivity	µmho/cm	146			2/29/2012	TRE Sample

KPDES Outfall Nonradiological Data

Table C.3.3. Nonradiological Effluent Data for Outfall 017 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
Conductivity	µmho/cm	240			2/29/2012	TRE Sample
Conductivity	µmho/cm	106			3/22/2012	TRE Sample
Conductivity	µmho/cm	310			3/23/2012	TRE Sample
Conductivity	µmho/cm	318			10/18/2012	TRE Sample
Conductivity	µmho/cm	351			10/18/2012	TRE Sample
Conductivity	µmho/cm	113			12/20/2012	TRE Sample
Conductivity	µmho/cm	232			12/20/2012	TRE Sample
Dissolved Oxygen	mg/L	9.08			1/9/2012	
Dissolved Oxygen	mg/L	27.45			1/11/2012	
Dissolved Oxygen	mg/L	22.4			1/11/2012	
Dissolved Oxygen	mg/L	11.89			1/13/2012	
Dissolved Oxygen	mg/L	14.81			2/13/2012	
Dissolved Oxygen	mg/L	12.88			2/15/2012	
Dissolved Oxygen	mg/L	14.33			3/7/2012	
Dissolved Oxygen	mg/L	11.29			1/25/2012	TRE Sample
Dissolved Oxygen	mg/L	8.59			3/22/2012	TRE Sample
Dissolved Oxygen	mg/L	10.48			3/23/2012	TRE Sample
Dissolved Solids	mg/L	143	35		1/26/2012	TRE Sample
Dissolved Solids	mg/L	62	35		3/22/2012	TRE Sample
Dissolved Solids	mg/L	186	35		3/23/2012	TRE Sample
Dissolved Solids	mg/L	254	35		7/9/2012	TRE Sample
Dissolved Solids	mg/L	195	35		11/27/2012	TRE Sample
Dissolved Solids	mg/L	64	35		12/20/2012	TRE Sample
Flow Rate	mgd	0.01			1/9/2012	
Flow Rate	mgd	0.19			1/11/2012	
Flow Rate	mgd	0.35			1/11/2012	
Flow Rate	mgd	0.01			1/13/2012	
Flow Rate	mgd	0.01			2/13/2012	
Flow Rate	mgd	0.01			2/15/2012	
Flow Rate	mgd	0.01			2/17/2012	
Flow Rate	mgd	0.01		<	2/27/2012	
Flow Rate	mgd	0.02			3/5/2012	
Flow Rate	mgd	0.0043			3/7/2012	
Flow Rate	mgd	0.1			3/9/2012	
Flow Rate	mgd	0.2			4/16/2012	
Flow Rate	mgd	0.007			4/18/2012	
Flow Rate	mgd	0.002			4/20/2012	
Flow Rate	mgd	0.03			5/21/2012	
Flow Rate	mgd	0.069			6/5/2012	
Flow Rate	mgd	0.55			7/9/2012	
Flow Rate	mgd	0.002		<	7/16/2012	
Flow Rate	mgd	0.002		<	7/18/2012	
Flow Rate	mgd	0.002		<	7/20/2012	
Flow Rate	mgd	0.0069			8/27/2012	
Flow Rate	mgd	0.002		<	8/29/2012	
Flow Rate	mgd	0.002			8/31/2012	
Flow Rate	mgd	0.037			9/4/2012	
Flow Rate	mgd	0.043			9/17/2012	

KPDES Outfall Nonradiological Data

Table C.3.3. Nonradiological Effluent Data for Outfall 017 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
Flow Rate	mgd	0.021			9/19/2012	
Flow Rate	mgd	0.01			9/21/2012	
Flow Rate	mgd	0.0134			10/3/2012	
Flow Rate	mgd	0.0321			10/15/2012	
Flow Rate	mgd	0.0321			10/17/2012	
Flow Rate	mgd	0.0839			10/19/2012	
Flow Rate	mgd	1.105			11/12/2012	
Flow Rate	mgd	2			11/14/2012	
Flow Rate	mgd	0.0134			11/16/2012	
Flow Rate	mgd	0.01			12/3/2012	
Flow Rate	mgd	0.055			12/7/2012	
Flow Rate	mgd	0.055			12/10/2012	
Flow Rate	mgd	0.055			12/12/2012	
Flow Rate	mgd	0.0174			12/14/2012	
Flow Rate	mgd	0.01			1/9/2012	TRE Sample
Flow Rate	mgd	0.19			1/11/2012	TRE Sample
Flow Rate	mgd	4.6			1/25/2012	TRE Sample
Flow Rate	mgd	0.3063			1/26/2012	TRE Sample
Flow Rate	mgd	0.0043			1/31/2012	TRE Sample
Flow Rate	mgd	0.0069			1/31/2012	TRE Sample
Flow Rate	mgd	0.01			2/13/2012	TRE Sample
Flow Rate	mgd	0.55			2/29/2012	TRE Sample
Flow Rate	mgd	1.25			2/29/2012	TRE Sample
Flow Rate	mgd	1.45			3/22/2012	TRE Sample
Flow Rate	mgd	0.19			3/23/2012	TRE Sample
Flow Rate	mgd	0.03			4/16/2012	TRE Sample
Flow Rate	mgd	0.2			4/16/2012	TRE Sample
Flow Rate	mgd	0.021			5/21/2012	TRE Sample
Flow Rate	mgd	0.032			5/21/2012	TRE Sample
Flow Rate	mgd	0.0267			6/5/2012	TRE Sample
Flow Rate	mgd	0.069			6/5/2012	TRE Sample
Flow Rate	mgd	0.0069			6/12/2012	TRE Sample
Flow Rate	mgd	0.027			6/12/2012	TRE Sample
Flow Rate	mgd	0.022			7/9/2012	TRE Sample
Flow Rate	mgd	0.55			7/9/2012	TRE Sample
Flow Rate	mgd	0.006			7/30/2012	TRE Sample
Flow Rate	mgd	0.022			7/30/2012	TRE Sample
Flow Rate	mgd	0.017			9/4/2012	TRE Sample
Flow Rate	mgd	0.037			9/4/2012	TRE Sample
Flow Rate	mgd	0.1086			9/27/2012	TRE Sample
Flow Rate	mgd	0.5073			9/27/2012	TRE Sample
Flow Rate	mgd	0.1002			10/18/2012	TRE Sample
Flow Rate	mgd	0.1784			10/18/2012	TRE Sample
Flow Rate	mgd	0.351			11/12/2012	TRE Sample
Flow Rate	mgd	1.105			11/12/2012	TRE Sample
Flow Rate	mgd	0.0267			11/27/2012	TRE Sample
Flow Rate	mgd	0.043			11/27/2012	TRE Sample
Flow Rate	mgd	0.201			12/20/2012	TRE Sample
Flow Rate	mgd	1.583			12/20/2012	TRE Sample

KPDES Outfall Nonradiological Data

Table C.3.3. Nonradiological Effluent Data for Outfall 017 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
Hardness - Total as CaCO3	mg/L	88	20		1/11/2012	
Hardness - Total as CaCO3	mg/L	70	20		4/16/2012	Duplicate
Hardness - Total as CaCO3	mg/L	68	20		4/16/2012	
Hardness - Total as CaCO3	mg/L	130	10		7/9/2012	
Hardness - Total as CaCO3	mg/L	150	10		10/3/2012	
Hardness - Total as CaCO3	mg/L	220	10		1/9/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	99	10		1/11/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	53	10		1/25/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	54	10		1/25/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	55	10		1/25/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	63	10		1/25/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	110	10		1/25/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	150	10		1/25/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	160	10		1/25/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	170	10		1/25/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	89	10		1/26/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	90	10		1/26/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	98	10		1/26/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	100	10		1/26/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	110	10		1/26/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	120	10		1/26/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	150	10		1/31/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	160	10		1/31/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	140	10		2/13/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	67	10		2/29/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	90	10		2/29/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	42	10		3/22/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	110	10		3/23/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	67	10		4/16/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	100	10		4/16/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	99	10		5/21/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	100	10		5/21/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	120	10		6/5/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	130	10		6/5/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	110	10		6/12/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	120	10		6/12/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	130	10		7/9/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	150	10		7/9/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	81	10		7/30/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	90	10		7/30/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	150	10		9/4/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	78	10		9/27/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	100	10		9/27/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	140	10		10/18/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	140	10		10/18/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	73	10		11/12/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	88	10		11/12/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	110	10		11/27/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	120	10		11/27/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	48	10		12/20/2012	TRE Sample
Hardness - Total as CaCO3	mg/L	92	10		12/20/2012	TRE Sample

KPDES Outfall Nonradiological Data

Table C.3.3. Nonradiological Effluent Data for Outfall 017 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
Iron	mg/L	0.268	0.01		1/26/2012	TRE Sample
Iron	mg/L	0.349	0.01	N	3/22/2012	TRE Sample
Iron	mg/L	0.365	0.01	N	3/23/2012	TRE Sample
Iron	mg/L	0.235	0.01	N	7/9/2012	TRE Sample
Iron	mg/L	0.117	0.01		11/27/2012	TRE Sample
Iron	mg/L	0.439	0.01		12/20/2012	TRE Sample
Heptachlor	µg/L	0.0005	0.0005	U	1/11/2012	
Heptachlor	µg/L	0.0005	0.0005	U	4/16/2012	Duplicate
Heptachlor	µg/L	0.0005	0.0005	U	4/16/2012	
Heptachlor	µg/L	0.0005	0.0005	U	7/9/2012	
Heptachlor	µg/L	0.0005	0.0005	U	10/3/2012	
Oil and Grease	mg/L	7	7	U	1/11/2012	Duplicate
Oil and Grease	mg/L	7	7	U	1/11/2012	
Oil and Grease	mg/L	7	7	U	2/27/2012	Duplicate
Oil and Grease	mg/L	7	7	U	2/27/2012	
Oil and Grease	mg/L	7	7	U	3/9/2012	
Oil and Grease	mg/L	7	7	U	3/9/2012	Duplicate
Oil and Grease	mg/L	7	7	U	4/16/2012	
Oil and Grease	mg/L	7	7	U	4/16/2012	Duplicate
Oil and Grease	mg/L	7	7	U	5/21/2012	Duplicate
Oil and Grease	mg/L	7	7	U	5/21/2012	
Oil and Grease	mg/L	7	7	U	6/5/2012	
Oil and Grease	mg/L	7	7	U	6/5/2012	Duplicate
Oil and Grease	mg/L	7	7	U	7/9/2012	
Oil and Grease	mg/L	7	7	U	8/27/2012	Duplicate
Oil and Grease	mg/L	7	7	U	8/27/2012	
Oil and Grease	mg/L	7	7	U	9/4/2012	Duplicate
Oil and Grease	mg/L	7	7	U	9/4/2012	
Oil and Grease	mg/L	7	7	U	10/3/2012	
Oil and Grease	mg/L	7	7	U	10/3/2012	Duplicate
Oil and Grease	mg/L	7	7	U	11/12/2012	
Oil and Grease	mg/L	7	7	U	12/3/2012	
PCB-1016	µg/L	0.17	0.17	U	1/11/2012	
PCB-1016	µg/L	0.17	0.17	U	1/11/2012	Duplicate
PCB-1016	µg/L	0.17	0.17	UY	2/27/2012	
PCB-1016	µg/L	0.17	0.17	UY	2/27/2012	Duplicate
PCB-1016	µg/L	0.17	0.17	U	3/9/2012	
PCB-1016	µg/L	0.17	0.17	U	3/9/2012	Duplicate
PCB-1016	µg/L	0.17	0.17	U	4/16/2012	Duplicate
PCB-1016	µg/L	0.17	0.17	U	4/16/2012	
PCB-1016	µg/L	0.17	0.17	UY	5/21/2012	Duplicate
PCB-1016	µg/L	0.17	0.17	UY	5/21/2012	
PCB-1016	µg/L	0.17	0.17	U	6/5/2012	Duplicate
PCB-1016	µg/L	0.17	0.17	U	6/5/2012	
PCB-1016	µg/L	0.17	0.17	U	7/9/2012	
PCB-1016	µg/L	0.17	0.17	U	8/27/2012	
PCB-1016	µg/L	0.17	0.17	U	8/27/2012	Duplicate
PCB-1016	µg/L	0.17	0.17	U	9/4/2012	
PCB-1016	µg/L	0.16	0.16	U	9/4/2012	Duplicate

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Table C.3.3. Nonradiological Effluent Data for Outfall 017 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
PCB-1016	µg/L	0.17	0.17	U	10/3/2012	Duplicate
PCB-1016	µg/L	0.17	0.17	U	10/3/2012	
PCB-1016	µg/L	0.16	0.16	UY	11/12/2012	
PCB-1016	µg/L	0.17	0.17	UY	12/3/2012	
PCB-1221	µg/L	0.18	0.18	U	1/11/2012	
PCB-1221	µg/L	0.18	0.18	U	1/11/2012	Duplicate
PCB-1221	µg/L	0.18	0.18	UY	2/27/2012	
PCB-1221	µg/L	0.18	0.18	UY	2/27/2012	Duplicate
PCB-1221	µg/L	0.18	0.18	U	3/9/2012	Duplicate
PCB-1221	µg/L	0.18	0.18	U	3/9/2012	
PCB-1221	µg/L	0.18	0.18	U	4/16/2012	
PCB-1221	µg/L	0.18	0.18	U	4/16/2012	Duplicate
PCB-1221	µg/L	0.18	0.18	UY	5/21/2012	
PCB-1221	µg/L	0.18	0.18	UY	5/21/2012	Duplicate
PCB-1221	µg/L	0.18	0.18	U	6/5/2012	Duplicate
PCB-1221	µg/L	0.18	0.18	U	6/5/2012	
PCB-1221	µg/L	0.18	0.18	U	7/9/2012	
PCB-1221	µg/L	0.18	0.18	U	8/27/2012	Duplicate
PCB-1221	µg/L	0.18	0.18	U	8/27/2012	
PCB-1221	µg/L	0.18	0.18	U	9/4/2012	
PCB-1221	µg/L	0.17	0.17	U	9/4/2012	Duplicate
PCB-1221	µg/L	0.18	0.18	U	10/3/2012	
PCB-1221	µg/L	0.18	0.18	U	10/3/2012	Duplicate
PCB-1221	µg/L	0.17	0.17	UY	11/12/2012	
PCB-1221	µg/L	0.18	0.18	UY	12/3/2012	
PCB-1232	µg/L	0.14	0.14	U	1/11/2012	
PCB-1232	µg/L	0.14	0.14	U	1/11/2012	Duplicate
PCB-1232	µg/L	0.14	0.14	UY	2/27/2012	Duplicate
PCB-1232	µg/L	0.14	0.14	UY	2/27/2012	
PCB-1232	µg/L	0.14	0.14	U	3/9/2012	
PCB-1232	µg/L	0.14	0.14	U	3/9/2012	Duplicate
PCB-1232	µg/L	0.14	0.14	U	4/16/2012	
PCB-1232	µg/L	0.14	0.14	U	4/16/2012	Duplicate
PCB-1232	µg/L	0.14	0.14	UY	5/21/2012	Duplicate
PCB-1232	µg/L	0.14	0.14	UY	5/21/2012	
PCB-1232	µg/L	0.14	0.14	U	6/5/2012	
PCB-1232	µg/L	0.14	0.14	U	6/5/2012	Duplicate
PCB-1232	µg/L	0.14	0.14	U	7/9/2012	
PCB-1232	µg/L	0.14	0.14	U	8/27/2012	Duplicate
PCB-1232	µg/L	0.14	0.14	U	8/27/2012	
PCB-1232	µg/L	0.14	0.14	U	9/4/2012	
PCB-1232	µg/L	0.13	0.13	U	9/4/2012	Duplicate
PCB-1232	µg/L	0.14	0.14	U	10/3/2012	Duplicate
PCB-1232	µg/L	0.14	0.14	U	10/3/2012	
PCB-1232	µg/L	0.14	0.14	UY	11/12/2012	
PCB-1232	µg/L	0.14	0.14	UY	12/3/2012	
PCB-1242	µg/L	0.1	0.1	U	1/11/2012	Duplicate
PCB-1242	µg/L	0.1	0.1	U	1/11/2012	
PCB-1242	µg/L	0.1	0.1	UY	2/27/2012	Duplicate

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Table C.3.3. Nonradiological Effluent Data for Outfall 017 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
PCB-1242	µg/L	0.1	0.1	UY	2/27/2012	
PCB-1242	µg/L	0.1	0.1	U	3/9/2012	
PCB-1242	µg/L	0.1	0.1	U	3/9/2012	Duplicate
PCB-1242	µg/L	0.1	0.1	U	4/16/2012	
PCB-1242	µg/L	0.1	0.1	U	4/16/2012	Duplicate
PCB-1242	µg/L	0.1	0.1	UY	5/21/2012	
PCB-1242	µg/L	0.1	0.1	UY	5/21/2012	Duplicate
PCB-1242	µg/L	0.1	0.1	U	6/5/2012	Duplicate
PCB-1242	µg/L	0.1	0.1	U	6/5/2012	
PCB-1242	µg/L	0.1	0.1	U	7/9/2012	
PCB-1242	µg/L	0.1	0.1	U	8/27/2012	
PCB-1242	µg/L	0.1	0.1	U	8/27/2012	Duplicate
PCB-1242	µg/L	0.1	0.1	U	9/4/2012	
PCB-1242	µg/L	0.09	0.09	U	9/4/2012	Duplicate
PCB-1242	µg/L	0.1	0.1	U	10/3/2012	
PCB-1242	µg/L	0.1	0.1	U	10/3/2012	Duplicate
PCB-1242	µg/L	0.1	0.1	UY	11/12/2012	
PCB-1242	µg/L	0.1	0.1	UY	12/3/2012	
PCB-1248	µg/L	0.12	0.12	U	1/11/2012	Duplicate
PCB-1248	µg/L	0.12	0.12	U	1/11/2012	
PCB-1248	µg/L	0.12	0.12	UY	2/27/2012	
PCB-1248	µg/L	0.12	0.12	UY	2/27/2012	Duplicate
PCB-1248	µg/L	0.12	0.12	U	3/9/2012	
PCB-1248	µg/L	0.12	0.12	U	3/9/2012	Duplicate
PCB-1248	µg/L	0.12	0.12	U	4/16/2012	
PCB-1248	µg/L	0.12	0.12	U	4/16/2012	Duplicate
PCB-1248	µg/L	0.12	0.12	UY	5/21/2012	
PCB-1248	µg/L	0.12	0.12	UY	5/21/2012	Duplicate
PCB-1248	µg/L	0.12	0.12	U	6/5/2012	Duplicate
PCB-1248	µg/L	0.12	0.12	U	6/5/2012	
PCB-1248	µg/L	0.12	0.12	U	7/9/2012	
PCB-1248	µg/L	0.12	0.12	U	8/27/2012	
PCB-1248	µg/L	0.12	0.12	U	8/27/2012	Duplicate
PCB-1248	µg/L	0.11	0.11	U	9/4/2012	Duplicate
PCB-1248	µg/L	0.12	0.12	U	9/4/2012	
PCB-1248	µg/L	0.12	0.12	U	10/3/2012	Duplicate
PCB-1248	µg/L	0.12	0.12	U	10/3/2012	
PCB-1248	µg/L	0.12	0.12	UY	11/12/2012	
PCB-1248	µg/L	0.12	0.12	UY	12/3/2012	
PCB-1254	µg/L	0.07	0.07	U	1/11/2012	Duplicate
PCB-1254	µg/L	0.07	0.07	U	1/11/2012	
PCB-1254	µg/L	0.07	0.07	UY	2/27/2012	
PCB-1254	µg/L	0.07	0.07	UY	2/27/2012	Duplicate
PCB-1254	µg/L	0.07	0.07	U	3/9/2012	
PCB-1254	µg/L	0.07	0.07	U	3/9/2012	Duplicate
PCB-1254	µg/L	0.07	0.07	U	4/16/2012	
PCB-1254	µg/L	0.07	0.07	U	4/16/2012	Duplicate
PCB-1254	µg/L	0.07	0.07	UY	5/21/2012	
PCB-1254	µg/L	0.07	0.07	UY	5/21/2012	Duplicate

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Table C.3.3. Nonradiological Effluent Data for Outfall 017 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
PCB-1254	µg/L	0.07	0.07	U	6/5/2012	Duplicate
PCB-1254	µg/L	0.07	0.07	U	6/5/2012	
PCB-1254	µg/L	0.07	0.07	U	7/9/2012	
PCB-1254	µg/L	0.07	0.07	U	8/27/2012	Duplicate
PCB-1254	µg/L	0.07	0.07	U	8/27/2012	
PCB-1254	µg/L	0.07	0.07	U	9/4/2012	Duplicate
PCB-1254	µg/L	0.07	0.07	U	9/4/2012	
PCB-1254	µg/L	0.07	0.07	U	10/3/2012	Duplicate
PCB-1254	µg/L	0.07	0.07	U	10/3/2012	
PCB-1254	µg/L	0.07	0.07	UY	11/12/2012	
PCB-1254	µg/L	0.07	0.07	UY	12/3/2012	
PCB-1260	µg/L	0.05	0.05	U	1/11/2012	
PCB-1260	µg/L	0.05	0.05	U	1/11/2012	Duplicate
PCB-1260	µg/L	0.05	0.05	UY	2/27/2012	Duplicate
PCB-1260	µg/L	0.05	0.05	UY	2/27/2012	
PCB-1260	µg/L	0.05	0.05	U	3/9/2012	
PCB-1260	µg/L	0.05	0.05	U	3/9/2012	Duplicate
PCB-1260	µg/L	0.05	0.05	U	4/16/2012	
PCB-1260	µg/L	0.05	0.05	U	4/16/2012	Duplicate
PCB-1260	µg/L	0.05	0.05	UY	5/21/2012	Duplicate
PCB-1260	µg/L	0.05	0.05	UY	5/21/2012	
PCB-1260	µg/L	0.05	0.05	U	6/5/2012	
PCB-1260	µg/L	0.05	0.05	U	6/5/2012	Duplicate
PCB-1260	µg/L	0.05	0.05	U	7/9/2012	
PCB-1260	µg/L	0.05	0.05	U	8/27/2012	Duplicate
PCB-1260	µg/L	0.05	0.05	U	8/27/2012	
PCB-1260	µg/L	0.05	0.05	U	9/4/2012	
PCB-1260	µg/L	0.05	0.05	U	9/4/2012	Duplicate
PCB-1260	µg/L	0.05	0.05	U	10/3/2012	
PCB-1260	µg/L	0.05	0.05	U	10/3/2012	Duplicate
PCB-1260	µg/L	0.05	0.05	UY	11/12/2012	
PCB-1260	µg/L	0.05	0.05	UY	12/3/2012	
PCB-1268	µg/L	0.09	0.09	U	1/11/2012	
PCB-1268	µg/L	0.09	0.09	U	1/11/2012	Duplicate
PCB-1268	µg/L	0.09	0.09	UY	2/27/2012	Duplicate
PCB-1268	µg/L	0.09	0.09	UY	2/27/2012	
PCB-1268	µg/L	0.09	0.09	U	3/9/2012	
PCB-1268	µg/L	0.09	0.09	U	3/9/2012	Duplicate
PCB-1268	µg/L	0.09	0.09	U	4/16/2012	
PCB-1268	µg/L	0.09	0.09	U	4/16/2012	Duplicate
PCB-1268	µg/L	0.09	0.09	UY	5/21/2012	Duplicate
PCB-1268	µg/L	0.09	0.09	UY	5/21/2012	
PCB-1268	µg/L	0.09	0.09	U	6/5/2012	Duplicate
PCB-1268	µg/L	0.09	0.09	U	6/5/2012	
PCB-1268	µg/L	0.09	0.09	U	7/9/2012	
PCB-1268	µg/L	0.09	0.09	U	8/27/2012	Duplicate
PCB-1268	µg/L	0.09	0.09	U	8/27/2012	
PCB-1268	µg/L	0.08	0.08	U	9/4/2012	Duplicate
PCB-1268	µg/L	0.09	0.09	U	9/4/2012	

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Table C.3.3. Nonradiological Effluent Data for Outfall 017 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
PCB-1268	µg/L	0.09	0.09	U	10/3/2012	
PCB-1268	µg/L	0.09	0.09	U	10/3/2012	Duplicate
PCB-1268	µg/L	0.09	0.09	UY	11/12/2012	
PCB-1268	µg/L	0.09	0.09	UY	12/3/2012	
pH	Std Unit	8.33			1/9/2012	
pH	Std Unit	8.85			1/11/2012	
pH	Std Unit	8.14			1/11/2012	
pH	Std Unit	7.86			1/13/2012	
pH	Std Unit	6.81			2/13/2012	
pH	Std Unit	8.06			2/15/2012	
pH	Std Unit	7.75			2/17/2012	
pH	Std Unit	8.33			2/27/2012	
pH	Std Unit	8.12			3/5/2012	
pH	Std Unit	8.19			3/7/2012	
pH	Std Unit	8.47			3/9/2012	
pH	Std Unit	7.75			4/16/2012	
pH	Std Unit	6.59			4/18/2012	
pH	Std Unit	7.73			4/20/2012	
pH	Std Unit	7.91			5/21/2012	
pH	Std Unit	7.86			6/5/2012	
pH	Std Unit	7.7			7/9/2012	
pH	Std Unit	7.52			7/16/2012	
pH	Std Unit	7.95			7/18/2012	
pH	Std Unit	6.78			7/20/2012	
pH	Std Unit	8.16			8/27/2012	
pH	Std Unit	7.78			8/27/2012	
pH	Std Unit	7.6			8/29/2012	
pH	Std Unit	6.79			8/31/2012	
pH	Std Unit	7.74			9/4/2012	
pH	Std Unit	7.19			9/17/2012	
pH	Std Unit	6.73			9/19/2012	
pH	Std Unit	7.19			9/21/2012	
pH	Std Unit	7.67			10/3/2012	
pH	Std Unit	7.92			10/15/2012	
pH	Std Unit	7.4			10/17/2012	
pH	Std Unit	7.97			10/19/2012	
pH	Std Unit	8.14			11/12/2012	
pH	Std Unit	8.18			11/14/2012	
pH	Std Unit	8.51			11/16/2012	
pH	Std Unit	8.2			12/3/2012	
pH	Std Unit	7.64			12/3/2012	
pH	Std Unit	7.83			12/5/2012	
pH	Std Unit	7.87			12/7/2012	
pH	Std Unit	7.23			12/10/2012	
pH	Std Unit	6.51			12/12/2012	
pH	Std Unit	7.83			12/14/2012	
pH	Std Unit	8.33			1/9/2012	TRE Sample
pH	Std Unit	8.53			1/9/2012	TRE Sample
pH	Std Unit	8.14			1/11/2012	TRE Sample

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Table C.3.3. Nonradiological Effluent Data for Outfall 017 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
pH	Std Unit	7.95			1/25/2012	TRE Sample
pH	Std Unit	7.71			1/26/2012	TRE Sample
pH	Std Unit	7.96			1/31/2012	TRE Sample
pH	Std Unit	8.36			1/31/2012	TRE Sample
pH	Std Unit	6.81			2/13/2012	TRE Sample
pH	Std Unit	7.04			2/13/2012	TRE Sample
pH	Std Unit	7.9			2/29/2012	TRE Sample
pH	Std Unit	8			2/29/2012	TRE Sample
pH	Std Unit	7.97			3/22/2012	TRE Sample
pH	Std Unit	7.67			3/23/2012	TRE Sample
pH	Std Unit	7.75			4/16/2012	TRE Sample
pH	Std Unit	8.96			4/16/2012	TRE Sample
pH	Std Unit	7.91			5/21/2012	TRE Sample
pH	Std Unit	8.03			5/21/2012	TRE Sample
pH	Std Unit	7.66			6/5/2012	TRE Sample
pH	Std Unit	7.86			6/5/2012	TRE Sample
pH	Std Unit	7.27			6/12/2012	TRE Sample
pH	Std Unit	7.47			6/12/2012	TRE Sample
pH	Std Unit	7.7			7/9/2012	TRE Sample
pH	Std Unit	7.81			7/9/2012	TRE Sample
pH	Std Unit	7.44			7/30/2012	TRE Sample
pH	Std Unit	7.91			7/30/2012	TRE Sample
pH	Std Unit	7.5			9/4/2012	TRE Sample
pH	Std Unit	7.74			9/4/2012	TRE Sample
pH	Std Unit	7.58			9/27/2012	TRE Sample
pH	Std Unit	8.15			9/27/2012	TRE Sample
pH	Std Unit	8.04			10/18/2012	TRE Sample
pH	Std Unit	8.62			10/18/2012	TRE Sample
pH	Std Unit	8.13			11/12/2012	TRE Sample
pH	Std Unit	8.38			11/12/2012	TRE Sample
pH	Std Unit	8.22			11/27/2012	TRE Sample
pH	Std Unit	8.84			11/27/2012	TRE Sample
pH	Std Unit	8.32			12/20/2012	TRE Sample
pH	Std Unit	8.33			12/20/2012	TRE Sample
PCB, Total	µg/L	0.18	0.18	U	1/11/2012	
PCB, Total	µg/L	0.18	0.18	U	1/11/2012	Duplicate
PCB, Total	µg/L	0.18	0.18	UY	2/27/2012	
PCB, Total	µg/L	0.18	0.18	UY	2/27/2012	Duplicate
PCB, Total	µg/L	0.18	0.18	U	3/9/2012	
PCB, Total	µg/L	0.18	0.18	U	3/9/2012	Duplicate
PCB, Total	µg/L	0.18	0.18	U	4/16/2012	Duplicate
PCB, Total	µg/L	0.18	0.18	U	4/16/2012	
PCB, Total	µg/L	0.18	0.18	UY	5/21/2012	
PCB, Total	µg/L	0.18	0.18	UY	5/21/2012	Duplicate
PCB, Total	µg/L	0.18	0.18	U	6/5/2012	
PCB, Total	µg/L	0.18	0.18	U	6/5/2012	Duplicate
PCB, Total	µg/L	0.18	0.18	U	7/9/2012	
PCB, Total	µg/L	0.18	0.18	U	8/27/2012	Duplicate
PCB, Total	µg/L	0.18	0.18	U	8/27/2012	

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Table C.3.3. Nonradiological Effluent Data for Outfall 017 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
PCB, Total	µg/L	0.17	0.17	U	9/4/2012	Duplicate
PCB, Total	µg/L	0.18	0.18	U	9/4/2012	
PCB, Total	µg/L	0.18	0.18	U	10/3/2012	Duplicate
PCB, Total	µg/L	0.18	0.18	U	10/3/2012	
PCB, Total	µg/L	0.17	0.17	UY	11/12/2012	
PCB, Total	µg/L	0.18	0.18	UY	12/3/2012	
Suspended Solids	mg/L	16	16	U	1/11/2012	Duplicate
Suspended Solids	mg/L	16	16	U	1/11/2012	
Suspended Solids	mg/L	16	16	U	2/27/2012	Duplicate
Suspended Solids	mg/L	16	16	U	2/27/2012	
Suspended Solids	mg/L	16	16	U	3/9/2012	Duplicate
Suspended Solids	mg/L	16	16	U	3/9/2012	
Suspended Solids	mg/L	16	16	U	4/16/2012	
Suspended Solids	mg/L	16	16	U	4/16/2012	Duplicate
Suspended Solids	mg/L	16	16	U	5/21/2012	
Suspended Solids	mg/L	16	16	U	5/21/2012	Duplicate
Suspended Solids	mg/L	16	16	U	6/5/2012	
Suspended Solids	mg/L	16	16	U	6/5/2012	Duplicate
Suspended Solids	mg/L	16	16	U	7/9/2012	
Suspended Solids	mg/L	16	16	U	8/27/2012	
Suspended Solids	mg/L	16	16	U	8/27/2012	Duplicate
Suspended Solids	mg/L	16	16	U	9/4/2012	
Suspended Solids	mg/L	16	16	U	9/4/2012	Duplicate
Suspended Solids	mg/L	4	4	U	10/3/2012	
Suspended Solids	mg/L	4	4	U	10/3/2012	Duplicate
Suspended Solids	mg/L	10	10	U	11/12/2012	
Suspended Solids	mg/L	10	10	U	12/3/2012	
Suspended Solids	mg/L	16	U	16	1/26/2012	TRE Sample
Suspended Solids	mg/L	22		16	3/22/2012	TRE Sample
Suspended Solids	mg/L	16	U	16	3/23/2012	TRE Sample
Suspended Solids	mg/L	16	U	16	7/9/2012	TRE Sample
Suspended Solids	mg/L	16	U	16	11/27/2012	TRE Sample
Suspended Solids	mg/L	16		16	12/20/2012	TRE Sample
Temperature	deg F	44.9			1/9/2012	
Temperature	deg F	46.5			1/11/2012	
Temperature	deg F	47.4			1/11/2012	
Temperature	deg F	36.3			1/13/2012	
Temperature	deg F	37.5			2/13/2012	
Temperature	deg F	40.8			2/15/2012	
Temperature	deg F	42.2			2/17/2012	
Temperature	deg F	46.7			2/27/2012	
Temperature	deg F	44.4			3/5/2012	
Temperature	deg F	47.1			3/7/2012	
Temperature	deg F	47.1			3/9/2012	
Temperature	deg F	63			4/16/2012	
Temperature	deg F	58.1			4/18/2012	
Temperature	deg F	60.4			4/20/2012	
Temperature	deg F	71.6			5/21/2012	
Temperature	deg F	71.6			6/5/2012	

KPDES Outfall Nonradiological Data

Table C.3.3. Nonradiological Effluent Data for Outfall 017 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
Temperature	deg F	80.2			7/9/2012	
Temperature	deg F	75.2			7/16/2012	
Temperature	deg F	77.4			7/18/2012	
Temperature	deg F	78.2			7/20/2012	
Temperature	deg F	75.1			8/27/2012	
Temperature	deg F	78.1			8/27/2012	
Temperature	deg F	71.4			8/29/2012	
Temperature	deg F	74.7			8/31/2012	
Temperature	deg F	78.4			9/4/2012	
Temperature	deg F	72			9/17/2012	
Temperature	deg F	62.9			9/19/2012	
Temperature	deg F	65.1			9/21/2012	
Temperature	deg F	62.5			10/3/2012	
Temperature	deg F	60.9			10/15/2012	
Temperature	deg F	61.2			10/17/2012	
Temperature	deg F	58.6			10/19/2012	
Temperature	deg F	54.1			11/12/2012	
Temperature	deg F	46.7			11/14/2012	
Temperature	deg F	44.4			11/16/2012	
Temperature	deg F	57.6			12/3/2012	
Temperature	deg F	55.2			12/3/2012	
Temperature	deg F	35.8			12/5/2012	
Temperature	deg F	39.6			12/7/2012	
Temperature	deg F	34.8			12/10/2012	
Temperature	deg F	35.1			12/12/2012	
Temperature	deg F	36.5			12/14/2012	
Temperature	deg F	44.9			1/9/2012	TRE Sample
Temperature	deg F	48.1			1/9/2012	TRE Sample
Temperature	deg F	47.4			1/11/2012	TRE Sample
Temperature	deg F	45.2			1/25/2012	TRE Sample
Temperature	deg F	45.7			1/31/2012	TRE Sample
Temperature	deg F	49.8			1/31/2012	TRE Sample
Temperature	deg F	37.5			2/13/2012	TRE Sample
Temperature	deg F	39.5			2/13/2012	TRE Sample
Temperature	deg F	57.7			2/29/2012	TRE Sample
Temperature	deg F	58.8			2/29/2012	TRE Sample
Temperature	deg F	64.3			3/22/2012	TRE Sample
Temperature	deg F	62.4			3/23/2012	TRE Sample
Temperature	deg F	63			4/16/2012	TRE Sample
Temperature	deg F	68.4			4/16/2012	TRE Sample
Temperature	deg F	71.6			5/21/2012	TRE Sample
Temperature	deg F	75.5			5/21/2012	TRE Sample
Temperature	deg F	71.6			6/5/2012	TRE Sample
Temperature	deg F	76.6			6/5/2012	TRE Sample
Temperature	deg F	72.4			6/12/2012	TRE Sample
Temperature	deg F	76			6/12/2012	TRE Sample
Temperature	deg F	80.2			7/9/2012	TRE Sample
Temperature	deg F	81.8			7/9/2012	TRE Sample
Temperature	deg F	77.5			7/30/2012	TRE Sample

KPDES Outfall Nonradiological Data

Table C.3.3. Nonradiological Effluent Data for Outfall 017 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
Temperature	deg F	81.8			7/30/2012	TRE Sample
Temperature	deg F	78.4			9/4/2012	TRE Sample
Temperature	deg F	80.7			9/4/2012	TRE Sample
Temperature	deg F	69.5			9/27/2012	TRE Sample
Temperature	deg F	73.1			9/27/2012	TRE Sample
Temperature	deg F	61.2			10/18/2012	TRE Sample
Temperature	deg F	64.2			10/18/2012	TRE Sample
Temperature	deg F	54.1			11/12/2012	TRE Sample
Temperature	deg F	56.2			11/12/2012	TRE Sample
Temperature	deg F	43.1			11/27/2012	TRE Sample
Temperature	deg F	45			11/27/2012	TRE Sample
Temperature	deg F	52.2			12/20/2012	TRE Sample
Temperature	deg F	54.8			12/20/2012	TRE Sample
Total Organic Carbon	mg/L	2.5	1		1/26/2012	TRE Sample
Total Organic Carbon	mg/L	2.3	1		3/22/2012	TRE Sample
Total Organic Carbon	mg/L	4.1	1		3/23/2012	TRE Sample
Total Organic Carbon	mg/L	5.3	1		7/9/2012	TRE Sample
Total Organic Carbon	mg/L	2.4	1		11/27/2012	TRE Sample
Total Organic Carbon	mg/L	1.8	1		12/20/2012	TRE Sample
Uranium	mg/L	0.0014	0.001	B	1/11/2012	
Uranium	mg/L	0.0014	0.001	B	1/11/2012	Duplicate
Uranium	mg/L	0.0039	0.001		2/27/2012	Duplicate
Uranium	mg/L	0.0039	0.001		2/27/2012	
Uranium	mg/L	0.002	0.001		3/9/2012	Duplicate
Uranium	mg/L	0.0021	0.001		3/9/2012	
Uranium	mg/L	0.001	0.001	UB	4/16/2012	
Uranium	mg/L	0.001	0.001	UB	4/16/2012	Duplicate
Uranium	mg/L	0.001	0.001	U	5/21/2012	
Uranium	mg/L	0.001	0.001	U	5/21/2012	Duplicate
Uranium	mg/L	0.001	0.001	U	6/5/2012	Duplicate
Uranium	mg/L	0.001	0.001	U	6/5/2012	
Uranium	mg/L	0.001	0.001	U	7/9/2012	
Uranium	mg/L	0.001	0.001	U	8/27/2012	Duplicate
Uranium	mg/L	0.001	0.001	U	8/27/2012	
Uranium	mg/L	0.0012	0.001		9/4/2012	
Uranium	mg/L	0.0012	0.001		9/4/2012	Duplicate
Uranium	mg/L	0.0013	0.001		10/3/2012	Duplicate
Uranium	mg/L	0.0013	0.001		10/3/2012	
Uranium	mg/L	0.0012	0.001		11/12/2012	
Uranium	mg/L	0.002	0.001		12/3/2012	
Zinc	mg/L	0.02	0.02	UB	1/11/2012	Duplicate
Zinc	mg/L	0.02	0.02	UB	1/11/2012	
Zinc	mg/L	0.0233	0.02		2/27/2012	
Zinc	mg/L	0.0256	0.02		2/27/2012	Duplicate
Zinc	mg/L	0.0753	0.02		3/9/2012	Duplicate
Zinc	mg/L	0.0721	0.02		3/9/2012	
Zinc	mg/L	0.321	0.02		4/16/2012	
Zinc	mg/L	0.319	0.02		4/16/2012	Duplicate
Zinc	mg/L	0.098	0.02		5/21/2012	

KPDES Outfall Nonradiological Data

Table C.3.3. Nonradiological Effluent Data for Outfall 017 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
Zinc	mg/L	0.0979	0.02		5/21/2012	Duplicate
Zinc	mg/L	0.0636	0.02	X	6/5/2012	
Zinc	mg/L	0.0647	0.02	X	6/5/2012	Duplicate
Zinc	mg/L	0.112	0.02		7/9/2012	
Zinc	mg/L	0.02	0.02	U	8/27/2012	
Zinc	mg/L	0.02	0.02	U	8/27/2012	Duplicate
Zinc	mg/L	0.0246	0.02		9/4/2012	Duplicate
Zinc	mg/L	0.025	0.02		9/4/2012	
Zinc	mg/L	0.02	0.02	U	10/3/2012	
Zinc	mg/L	0.02	0.02	U	10/3/2012	Duplicate
Zinc	mg/L	0.122	0.02	N	11/12/2012	
Zinc	mg/L	0.0202	0.02		12/3/2012	
Zinc	mg/L	0.023	0.02		1/9/2012	TRE Sample
Zinc	mg/L	0.0323	0.02		1/9/2012	TRE Sample
Zinc	mg/L	0.0756	0.02	B	1/11/2012	TRE Sample
Zinc	mg/L	0.0534	0.02	X	1/25/2012	TRE Sample
Zinc	mg/L	0.0746	0.02		1/25/2012	TRE Sample
Zinc	mg/L	0.0982	0.02	X	1/25/2012	TRE Sample
Zinc	mg/L	0.116	0.02	X	1/25/2012	TRE Sample
Zinc	mg/L	0.139	0.02	X	1/25/2012	TRE Sample
Zinc	mg/L	0.146	0.02	X	1/25/2012	TRE Sample
Zinc	mg/L	0.152	0.02	X	1/25/2012	TRE Sample
Zinc	mg/L	0.173	0.02		1/25/2012	TRE Sample
Zinc	mg/L	0.116	0.02		1/26/2012	TRE Sample
Zinc	mg/L	0.128	0.02		1/26/2012	TRE Sample
Zinc	mg/L	0.137	0.02		1/26/2012	TRE Sample
Zinc	mg/L	0.149	0.02		1/26/2012	TRE Sample
Zinc	mg/L	0.181	0.02		1/26/2012	TRE Sample
Zinc	mg/L	0.193	0.02		1/26/2012	TRE Sample
Zinc	mg/L	0.194	0.02		1/26/2012	TRE Sample
Zinc	mg/L	0.0205	0.02		1/31/2012	TRE Sample
Zinc	mg/L	0.0272	0.02		1/31/2012	TRE Sample
Zinc	mg/L	0.02	0.02	U	2/13/2012	TRE Sample
Zinc	mg/L	0.0516	0.02		2/29/2012	TRE Sample
Zinc	mg/L	0.122	0.02		2/29/2012	TRE Sample
Zinc	mg/L	0.13	0.02		3/22/2012	TRE Sample
Zinc	mg/L	0.057	0.02		3/23/2012	TRE Sample
Zinc	mg/L	0.0869	0.02		4/16/2012	TRE Sample
Zinc	mg/L	0.321	0.02		4/16/2012	TRE Sample
Zinc	mg/L	0.0425	0.02		5/21/2012	TRE Sample
Zinc	mg/L	0.0988	0.02		5/21/2012	TRE Sample
Zinc	mg/L	0.0328	0.02	X	6/5/2012	TRE Sample
Zinc	mg/L	0.0627	0.02	X	6/5/2012	TRE Sample
Zinc	mg/L	0.0263	0.02	X	6/12/2012	TRE Sample
Zinc	mg/L	0.0412	0.02	X	6/12/2012	TRE Sample
Zinc	mg/L	0.0763	0.02		7/9/2012	TRE Sample
Zinc	mg/L	0.114	0.02		7/9/2012	TRE Sample
Zinc	mg/L	0.0263	0.02		7/30/2012	TRE Sample
Zinc	mg/L	0.0488	0.02		7/30/2012	TRE Sample

KPDES Outfall Nonradiological Data

Table C.3.3. Nonradiological Effluent Data for Outfall 017 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
Zinc	mg/L	0.0214	0.02		9/4/2012	TRE Sample
Zinc	mg/L	0.0246	0.02		9/4/2012	TRE Sample
Zinc	mg/L	0.0246	0.02		9/27/2012	TRE Sample
Zinc	mg/L	0.0798	0.02		9/27/2012	TRE Sample
Zinc	mg/L	0.0291	0.02		10/18/2012	TRE Sample
Zinc	mg/L	0.045	0.02		10/18/2012	TRE Sample (Duplicate)
Zinc	mg/L	0.0462	0.02		10/18/2012	TRE Sample
Zinc	mg/L	0.0465	0.02	N	11/12/2012	TRE Sample
Zinc	mg/L	0.129	0.02	N	11/12/2012	TRE Sample
Zinc	mg/L	0.0568	0.02		11/27/2012	TRE Sample
Zinc	mg/L	0.103	0.02		11/27/2012	TRE Sample
Zinc	mg/L	0.0719	0.02		12/20/2012	TRE Sample
Zinc	mg/L	0.135	0.02		12/20/2012	TRE Sample

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Table C.3.4. Nonradiological Effluent Data for Outfall 019

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
Flow Rate	mgd	0.15			10/16/2012
Hardness - Total as CaCO3	mg/L	99	10		10/16/2012
Iron	mg/L	0.158	0.01	N	10/16/2012
Oil and Grease	mg/L	7	7	U	10/16/2012
PCB-1016	µg/L	0.17	0.17	U	10/16/2012
PCB-1221	µg/L	0.18	0.18	U	10/16/2012
PCB-1232	µg/L	0.14	0.14	U	10/16/2012
PCB-1242	µg/L	0.1	0.1	U	10/16/2012
PCB-1248	µg/L	0.12	0.12	U	10/16/2012
PCB-1254	µg/L	0.07	0.07	U	10/16/2012
PCB-1260	µg/L	0.05	0.05	UJ	10/16/2012
PCB-1268	µg/L	0.09	0.09	U	10/16/2012
pH	Std Unit	7.3			10/16/2012
pH	Std Unit	7.31			10/16/2012
pH	Std Unit	7.1			10/22/2012
PCB, Total	µg/L	0.18	0.18	U	10/16/2012
Suspended Solids	mg/L	10	10	U	10/16/2012
Uranium	mg/L	0.001	0.001	U	10/16/2012
Zinc	mg/L	0.02	0.02	U	10/16/2012

KPDES Outfall Nonradiological Data

Table C.3.5. Nonradiological Effluent Data for Outfall 020

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
1,1,1-Trichloroethane	µg/L	1	1	U	1/4/2012	
1,1,1-Trichloroethane	µg/L	1	1	UX	4/3/2012	
1,1,1-Trichloroethane	µg/L	1	1	U	7/11/2012	Duplicate
1,1,1-Trichloroethane	µg/L	1	1	U	7/11/2012	
1,1,1-Trichloroethane	µg/L	1	1	U	10/3/2012	
Arsenic	mg/L	0.01	0.01	U	1/4/2012	
Arsenic	mg/L	0.01	0.01	BU	4/3/2012	
Arsenic	mg/L	0.01	0.01	U	7/11/2012	
Arsenic	mg/L	0.01	0.01	U	7/11/2012	Duplicate
Arsenic	mg/L	0.01	0.01	U	10/3/2012	
Carbonaceous Biochemical Oxygen Demand	mg/L	5	5	U	1/4/2012	
Carbonaceous Biochemical Oxygen Demand	mg/L	5	5	JU	4/3/2012	
Carbonaceous Biochemical Oxygen Demand	mg/L	5	5	JU	7/11/2012	Duplicate
Carbonaceous Biochemical Oxygen Demand	mg/L	5	5	JU	7/11/2012	
Carbonaceous Biochemical Oxygen Demand	mg/L	5	5	U	10/3/2012	
Chloride	mg/L	21	2		1/4/2012	
Chloride	mg/L	23	2		4/3/2012	
Chloride	mg/L	42	2		7/11/2012	Duplicate
Chloride	mg/L	42	2		7/11/2012	
Chloride	mg/L	25	2		10/3/2012	
Conductivity	µmho/cm	1021			3/5/2012	
Conductivity	µmho/cm	1074			4/3/2012	
Conductivity	µmho/cm	1280			5/3/2012	
Dissolved Oxygen	mg/L	9.76			1/4/2012	
Dissolved Oxygen	mg/L	8.68			2/6/2012	
Dissolved Oxygen	mg/L	9.15			3/5/2012	
Dissolved Oxygen	mg/L	8.21			4/3/2012	
Dissolved Oxygen	mg/L	7			5/3/2012	
Dissolved Oxygen	mg/L	8.82			6/12/2012	
Dissolved Oxygen	mg/L	6.94			7/11/2012	
Dissolved Oxygen	mg/L	7.66			9/6/2012	
Dissolved Oxygen	mg/L	9.87			11/7/2012	
Dissolved Oxygen	mg/L	8.16			12/5/2012	
Flow Rate	mgd	0.08			1/4/2012	
Flow Rate	mgd	0.08			2/6/2012	
Flow Rate	mgd	0.06			3/5/2012	
Flow Rate	mgd	0.08			4/3/2012	
Flow Rate	mgd	0.04			5/3/2012	
Flow Rate	mgd	0.08			6/12/2012	
Flow Rate	mgd	0.05			7/11/2012	
Flow Rate	mgd	0.08			8/1/2012	
Flow Rate	mgd	0.0043			9/6/2012	
Flow Rate	mgd	0.08			10/3/2012	
Flow Rate	mgd	0.08			11/7/2012	

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Table C.3.5. Nonradiological Effluent Data for Outfall 020 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
Flow Rate	mgd	0.08			12/5/2012	
Hardness - Total as CaCO3	mg/L	430	20		1/4/2012	
Hardness - Total as CaCO3	mg/L	490	20		4/3/2012	
Hardness - Total as CaCO3	mg/L	450	20		7/11/2012	
Hardness - Total as CaCO3	mg/L	460	20		7/11/2012	Duplicate
Hardness - Total as CaCO3	mg/L	450	20		10/3/2012	
Iron	mg/L	0.131	0.01		1/4/2012	
Iron	mg/L	1.23	0.1		4/3/2012	
Iron	mg/L	0.105	0.01		7/11/2012	
Iron	mg/L	0.0407	0.01		7/11/2012	Duplicate
Iron	mg/L	0.205	0.01	N	10/3/2012	
Nickel	mg/L	0.0134	0.005	B	1/4/2012	
Nickel	mg/L	0.0078	0.005		4/3/2012	
Nickel	mg/L	0.0066	0.005		7/11/2012	
Nickel	mg/L	0.0062	0.005		7/11/2012	Duplicate
Nickel	mg/L	0.005	0.005	U	10/3/2012	
Nitrate as Nitrogen	mg/L	1.6	1		1/4/2012	
Nitrate as Nitrogen	mg/L	1.7	1		4/3/2012	
Nitrate as Nitrogen	mg/L	2.6	1		7/11/2012	Duplicate
Nitrate as Nitrogen	mg/L	2.7	1		7/11/2012	
Nitrate as Nitrogen	mg/L	2.3	1		10/3/2012	
Oil and Grease	mg/L	7	7	U	1/4/2012	
Oil and Grease	mg/L	7	7	U	2/6/2012	
Oil and Grease	mg/L	7	7	U	3/5/2012	
Oil and Grease	mg/L	7	7	U	4/3/2012	
Oil and Grease	mg/L	7	7	U	5/3/2012	
Oil and Grease	mg/L	7	7	U	6/12/2012	
Oil and Grease	mg/L	7	7	U	7/11/2012	
Oil and Grease	mg/L	7	7	U	8/1/2012	
Oil and Grease	mg/L	7	7	U	9/6/2012	
Oil and Grease	mg/L	7	7	U	10/3/2012	
Oil and Grease	mg/L	7	7	U	11/7/2012	
Oil and Grease	mg/L	7	7	U	12/5/2012	Duplicate
Oil and Grease	mg/L	7	7	U	12/5/2012	
PCB-1016	µg/L	0.17	0.17	U	1/4/2012	
PCB-1016	µg/L	0.17	0.17	U	4/3/2012	
PCB-1016	µg/L	0.17	0.17	U	7/11/2012	
PCB-1016	µg/L	0.16	0.16	U	7/11/2012	Duplicate
PCB-1016	µg/L	0.17	0.17	U	10/3/2012	
PCB-1221	µg/L	0.18	0.18	U	1/4/2012	
PCB-1221	µg/L	0.18	0.18	U	4/3/2012	
PCB-1221	µg/L	0.17	0.17	U	7/11/2012	Duplicate
PCB-1221	µg/L	0.18	0.18	U	7/11/2012	
PCB-1221	µg/L	0.18	0.18	U	10/3/2012	
PCB-1232	µg/L	0.14	0.14	U	1/4/2012	
PCB-1232	µg/L	0.14	0.14	U	4/3/2012	
PCB-1232	µg/L	0.14	0.14	U	7/11/2012	Duplicate
PCB-1232	µg/L	0.14	0.14	U	7/11/2012	
PCB-1232	µg/L	0.14	0.14	U	10/3/2012	

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Table C.3.5. Nonradiological Effluent Data for Outfall 020 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
PCB-1242	µg/L	0.1	0.1	U	1/4/2012	
PCB-1242	µg/L	0.1	0.1	U	4/3/2012	
PCB-1242	µg/L	0.1	0.1	U	7/11/2012	Duplicate
PCB-1242	µg/L	0.1	0.1	U	7/11/2012	
PCB-1242	µg/L	0.1	0.1	U	10/3/2012	
PCB-1248	µg/L	0.12	0.12	U	1/4/2012	
PCB-1248	µg/L	0.12	0.12	U	4/3/2012	
PCB-1248	µg/L	0.12	0.12	U	7/11/2012	
PCB-1248	µg/L	0.12	0.12	U	7/11/2012	Duplicate
PCB-1248	µg/L	0.12	0.12	U	10/3/2012	
PCB-1254	µg/L	0.07	0.07	U	1/4/2012	
PCB-1254	µg/L	0.07	0.07	U	4/3/2012	
PCB-1254	µg/L	0.07	0.07	U	7/11/2012	Duplicate
PCB-1254	µg/L	0.07	0.07	U	7/11/2012	
PCB-1254	µg/L	0.07	0.07	U	10/3/2012	
PCB-1260	µg/L	0.05	0.05	U	1/4/2012	
PCB-1260	µg/L	0.05	0.05	U	4/3/2012	
PCB-1260	µg/L	0.05	0.05	U	7/11/2012	
PCB-1260	µg/L	0.05	0.05	U	7/11/2012	Duplicate
PCB-1260	µg/L	0.05	0.05	U	10/3/2012	
PCB-1268	µg/L	0.09	0.09	U	1/4/2012	
PCB-1268	µg/L	0.09	0.09	U	4/3/2012	
PCB-1268	µg/L	0.09	0.09	U	7/11/2012	
PCB-1268	µg/L	0.09	0.09	U	7/11/2012	Duplicate
PCB-1268	µg/L	0.09	0.09	U	10/3/2012	
pH	Std Unit	7.17			1/4/2012	
pH	Std Unit	7.44			2/6/2012	
pH	Std Unit	7.54			3/5/2012	
pH	Std Unit	7.36			4/3/2012	
pH	Std Unit	7.23			5/3/2012	
pH	Std Unit	7.12			6/12/2012	
pH	Std Unit	7.29			7/11/2012	
pH	Std Unit	7.02			8/1/2012	
pH	Std Unit	7.32			10/3/2012	
pH	Std Unit	7.97			11/7/2012	
pH	Std Unit	7.73			12/5/2012	
pH (Daily)	Std Unit	7.2			1/3/2012	
pH (Daily)	Std Unit	7.3			1/4/2012	
pH (Daily)	Std Unit	7.2			1/5/2012	
pH (Daily)	Std Unit	7.1			1/9/2012	
pH (Daily)	Std Unit	7.3			1/10/2012	
pH (Daily)	Std Unit	7.2			1/11/2012	
pH (Daily)	Std Unit	7.1			1/12/2012	
pH (Daily)	Std Unit	7.2			1/17/2012	
pH (Daily)	Std Unit	7.3			1/18/2012	
pH (Daily)	Std Unit	7.1			1/19/2012	
pH (Daily)	Std Unit	7.3			1/23/2012	
pH (Daily)	Std Unit	7.1			1/24/2012	
pH (Daily)	Std Unit	7.3			1/25/2012	

KPDES Outfall Nonradiological Data

Table C.3.5. Nonradiological Effluent Data for Outfall 020 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
pH (Daily)	Std Unit	7.4			1/26/2012
pH (Daily)	Std Unit	7.1			1/30/2012
pH (Daily)	Std Unit	7.1			1/31/2012
pH (Daily)	Std Unit	7.2			2/1/2012
pH (Daily)	Std Unit	7.1			2/2/2012
pH (Daily)	Std Unit	7.2			2/6/2012
pH (Daily)	Std Unit	7.3			2/7/2012
pH (Daily)	Std Unit	7.2			2/8/2012
pH (Daily)	Std Unit	7.2			2/9/2012
pH (Daily)	Std Unit	7.2			2/13/2012
pH (Daily)	Std Unit	7.3			2/14/2012
pH (Daily)	Std Unit	7.3			2/15/2012
pH (Daily)	Std Unit	7.2			2/16/2012
pH (Daily)	Std Unit	7.1			2/20/2012
pH (Daily)	Std Unit	7.2			2/21/2012
pH (Daily)	Std Unit	7.3			2/22/2012
pH (Daily)	Std Unit	7.3			2/23/2012
pH (Daily)	Std Unit	7.3			2/27/2012
pH (Daily)	Std Unit	7.2			2/28/2012
pH (Daily)	Std Unit	7.1			2/29/2012
pH (Daily)	Std Unit	7.2			3/1/2012
pH (Daily)	Std Unit	7.2			3/5/2012
pH (Daily)	Std Unit	7.3			3/6/2012
pH (Daily)	Std Unit	7.2			3/7/2012
pH (Daily)	Std Unit	7.1			3/8/2012
pH (Daily)	Std Unit	7.2			3/12/2012
pH (Daily)	Std Unit	7.2			3/13/2012
pH (Daily)	Std Unit	7.3			3/14/2012
pH (Daily)	Std Unit	7.2			3/15/2012
pH (Daily)	Std Unit	7.3			3/19/2012
pH (Daily)	Std Unit	7.2			3/20/2012
pH (Daily)	Std Unit	7.3			3/21/2012
pH (Daily)	Std Unit	7.1			3/22/2012
pH (Daily)	Std Unit	7.3			3/26/2012
pH (Daily)	Std Unit	7.2			3/27/2012
pH (Daily)	Std Unit	7.2			3/28/2012
pH (Daily)	Std Unit	7.1			3/29/2012
pH (Daily)	Std Unit	7.1			4/3/2012
pH (Daily)	Std Unit	7.1			4/4/2012
pH (Daily)	Std Unit	7.2			4/9/2012
pH (Daily)	Std Unit	7.2			4/10/2012
pH (Daily)	Std Unit	7.1			4/11/2012
pH (Daily)	Std Unit	7.2			4/12/2012
pH (Daily)	Std Unit	7.1			4/19/2012
pH (Daily)	Std Unit	7.2			4/23/2012
pH (Daily)	Std Unit	7.1			4/25/2012
pH (Daily)	Std Unit	7.23			5/3/2012
pH (Daily)	Std Unit	7.2			5/10/2012
pH (Daily)	Std Unit	7.2			5/15/2012

KPDES Outfall Nonradiological Data

Table C.3.5. Nonradiological Effluent Data for Outfall 020 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
pH (Daily)	Std Unit	7.1			5/21/2012
pH (Daily)	Std Unit	7.2			5/29/2012
pH (Daily)	Std Unit	7.1			6/5/2012
pH (Daily)	Std Unit	7			6/11/2012
pH (Daily)	Std Unit	7.12			6/12/2012
pH (Daily)	Std Unit	7.1			6/15/2012
pH (Daily)	Std Unit	6.9			6/20/2012
pH (Daily)	Std Unit	7.1			7/10/2012
pH (Daily)	Std Unit	7.29			7/11/2012
pH (Daily)	Std Unit	7.2			7/12/2012
pH (Daily)	Std Unit	7.2			7/17/2012
pH (Daily)	Std Unit	7			7/31/2012
pH (Daily)	Std Unit	7.7			8/1/2012
pH (Daily)	Std Unit	7			8/14/2012
pH (Daily)	Std Unit	7.1			8/15/2012
pH (Daily)	Std Unit	7.2			8/21/2012
pH (Daily)	Std Unit	7			9/4/2012
pH (Daily)	Std Unit	7			9/5/2012
pH (Daily)	Std Unit	7.1			9/6/2012
pH (Daily)	Std Unit	7.2			9/10/2012
pH (Daily)	Std Unit	6.9			9/11/2012
pH (Daily)	Std Unit	6.9			9/12/2012
pH (Daily)	Std Unit	6.9			9/13/2012
pH (Daily)	Std Unit	6.9			9/17/2012
pH (Daily)	Std Unit	6.9			9/18/2012
pH (Daily)	Std Unit	7.4			9/19/2012
pH (Daily)	Std Unit	7.3			9/20/2012
pH (Daily)	Std Unit	7.1			9/24/2012
pH (Daily)	Std Unit	6.9			10/1/2012
pH (Daily)	Std Unit	7			10/2/2012
pH (Daily)	Std Unit	7.32			10/3/2012
pH (Daily)	Std Unit	7.1			10/4/2012
pH (Daily)	Std Unit	6.9			10/8/2012
pH (Daily)	Std Unit	7			10/9/2012
pH (Daily)	Std Unit	7			10/10/2012
pH (Daily)	Std Unit	7			10/15/2012
pH (Daily)	Std Unit	7			10/16/2012
pH (Daily)	Std Unit	6.9			10/17/2012
pH (Daily)	Std Unit	7			10/18/2012
pH (Daily)	Std Unit	7.1			10/22/2012
pH (Daily)	Std Unit	7			10/23/2012
pH (Daily)	Std Unit	7			10/24/2012
pH (Daily)	Std Unit	7			10/25/2012
pH (Daily)	Std Unit	7.2			10/29/2012
pH (Daily)	Std Unit	7.1			10/30/2012
pH (Daily)	Std Unit	7			10/31/2012
pH (Daily)	Std Unit	7			11/1/2012
pH (Daily)	Std Unit	7.6			11/2/2012
pH (Daily)	Std Unit	7.2			11/6/2012

KPDES Outfall Nonradiological Data

Table C.3.5. Nonradiological Effluent Data for Outfall 020 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
pH (Daily)	Std Unit	7.9			11/7/2012	
pH (Daily)	Std Unit	6.9			11/12/2012	
pH (Daily)	Std Unit	7.1			11/13/2012	
pH (Daily)	Std Unit	7			11/14/2012	
pH (Daily)	Std Unit	7.1			11/15/2012	
pH (Daily)	Std Unit	7.1			11/19/2012	
pH (Daily)	Std Unit	7			11/20/2012	
pH (Daily)	Std Unit	7.1			11/26/2012	
pH (Daily)	Std Unit	7.6			11/27/2012	
pH (Daily)	Std Unit	7.4			11/28/2012	
pH (Daily)	Std Unit	7.4			11/29/2012	
pH (Daily)	Std Unit	7.3			12/3/2012	
pH (Daily)	Std Unit	7.73			12/5/2012	
pH (Daily)	Std Unit	7.5			12/6/2012	
pH (Daily)	Std Unit	7.1			12/10/2012	
pH (Daily)	Std Unit	7.2			12/11/2012	
pH (Daily)	Std Unit	7.1			12/12/2012	
pH (Daily)	Std Unit	7.2			12/13/2012	
pH (Daily)	Std Unit	7.3			12/17/2012	
pH (Daily)	Std Unit	7.3			12/18/2012	
pH (Daily)	Std Unit	7.1			12/19/2012	
pH (Daily)	Std Unit	7.3			12/20/2012	
pH (Daily)	Std Unit	7.3			12/26/2012	
pH (Daily)	Std Unit	7.3			12/27/2012	
Phosphorous	mg/L	0.06	0.05		1/4/2012	
Phosphorous	mg/L	0.11	0.05		4/3/2012	
Phosphorous	mg/L	0.04	0.04		7/11/2012	
Phosphorous	mg/L	0.04	0.04	U	7/11/2012	Duplicate
Phosphorous	mg/L	0.11	0.04		10/3/2012	
PCB, Total	µg/L	0.18	0.18	U	1/4/2012	
PCB, Total	µg/L	0.18	0.18	U	4/3/2012	
PCB, Total	µg/L	0.17	0.17	U	7/11/2012	Duplicate
PCB, Total	µg/L	0.18	0.18	U	7/11/2012	
PCB, Total	µg/L	0.18	0.18	U	10/3/2012	
Suspended Solids	mg/L	16	16	U	1/4/2012	
Suspended Solids	mg/L	16	16	U	2/6/2012	
Suspended Solids	mg/L	16	16	U	3/5/2012	
Suspended Solids	mg/L	16	16	U	4/3/2012	
Suspended Solids	mg/L	16	16	U	5/3/2012	
Suspended Solids	mg/L	16	16	U	6/12/2012	
Suspended Solids	mg/L	16	16	U	7/11/2012	
Suspended Solids	mg/L	16	16	U	8/1/2012	
Suspended Solids	mg/L	16	16	U	9/6/2012	
Suspended Solids	mg/L	8	8	U	10/3/2012	
Suspended Solids	mg/L	10	10	U	11/7/2012	
Suspended Solids	mg/L	16	16	U	12/5/2012	Duplicate
Suspended Solids	mg/L	16	16	U	12/5/2012	
Temperature	deg F	58.1			3/5/2012	
Temperature	deg F	63.6			4/3/2012	

KPDES Outfall Nonradiological Data

Table C.3.5. Nonradiological Effluent Data for Outfall 020 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
Temperature	deg F	63.6			4/3/2012	
Temperature	deg F	63.6			4/3/2012	
Temperature	deg F	63.6			4/3/2012	
Trichloroethene	µg/L	1	1	U	1/4/2012	
Trichloroethene	µg/L	1	1	UX	4/3/2012	
Trichloroethene	µg/L	1	1	U	7/11/2012	Duplicate
Trichloroethene	µg/L	1	1	U	7/11/2012	
Trichloroethene	µg/L	1	1	UJ	10/3/2012	
Uranium	mg/L	0.0188	0.001	B	1/4/2012	
Uranium	mg/L	0.0151	0.001		2/6/2012	
Uranium	mg/L	0.0156	0.001		3/5/2012	
Uranium	mg/L	0.0219	0.001		4/3/2012	
Uranium	mg/L	0.018	0.001		5/3/2012	
Uranium	mg/L	0.0092	0.001		6/12/2012	
Uranium	mg/L	0.0112	0.001		7/11/2012	
Uranium	mg/L	0.0082	0.001		8/1/2012	
Uranium	mg/L	0.0046	0.001		9/6/2012	
Uranium	mg/L	0.0201	0.001		10/3/2012	
Uranium	mg/L	0.0299	0.001		11/7/2012	
Uranium	mg/L	0.0149	0.001		12/5/2012	Duplicate
Uranium	mg/L	0.0146	0.001		12/5/2012	
Zinc	mg/L	0.0372	0.02		1/4/2012	
Zinc	mg/L	0.02	0.02	U	4/3/2012	
Zinc	mg/L	0.02	0.02	UBX	7/11/2012	Duplicate
Zinc	mg/L	0.02	0.02	UBX	7/11/2012	
Zinc	mg/L	0.02	0.02	U	10/3/2012	

Surface Water Nonradiological Data

Table C.3.6. Nonradiological Effluent Data for Landfill Surface Water Location L135

Upstream of the C-746-S&T Closed Landfills

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
Chemical Oxygen Demand	mg/L	36	27		2/29/2012
Chemical Oxygen Demand	mg/L	31	25		11/12/2012
Chloride	mg/L	5.9	2		2/29/2012
Chloride	mg/L	5.5	2		11/12/2012
Conductivity	µmho/cm	142			2/29/2012
Conductivity	µmho/cm	184			11/12/2012
Dissolved Oxygen	mg/L	8.76			2/29/2012
Dissolved Oxygen	mg/L	11.34			11/12/2012
Dissolved Solids	mg/L	152	87		2/29/2012
Dissolved Solids	mg/L	142	35		11/12/2012
Flow Rate	mgd	0.92			2/29/2012
Flow Rate	mgd	0.06			11/12/2012
Iron	mg/L	4.18	0.2	N	2/29/2012
Iron	mg/L	1.07	0.2	N	11/12/2012
pH	Std Unit	8.08			2/29/2012
pH	Std Unit	8.04			11/12/2012
Sodium	mg/L	4.84	0.1		2/29/2012
Sodium	mg/L	5	0.1		11/12/2012
Sulfate	mg/L	7.8	2		2/29/2012
Sulfate	mg/L	9.8	2		11/12/2012
Suspended Solids	mg/L	115	40		2/29/2012
Suspended Solids	mg/L	20	16	*	11/12/2012
Temperature	deg F	56.3			2/29/2012
Temperature	deg F	52			11/12/2012
Total Organic Carbon	mg/L	18	4	D	2/29/2012
Total Organic Carbon	mg/L	16.9	4	D	11/12/2012
Total Solids	mg/L	257	130		2/29/2012
Total Solids	mg/L	180	92		11/12/2012
Uranium	mg/L	0.004	0.001		2/29/2012
Uranium	mg/L	0.0046	0.001		11/12/2012

Table C.3.7. Nonradiological Effluent Data for Landfill Surface Water Location L136

At the C-746-S&T Closed Landfills

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
Chemical Oxygen Demand	mg/L	35	27		2/29/2012
Chloride	mg/L	2.2	2		2/29/2012
Conductivity	µmho/cm	287			2/29/2012
Dissolved Oxygen	mg/L	8.55			2/29/2012
Dissolved Solids	mg/L	229	87		2/29/2012
Flow Rate	mgd	0.43			2/29/2012
Iron	mg/L	2.62	0.2	N	2/29/2012
pH	Std Unit	8.11			2/29/2012
Sodium	mg/L	4.56	0.1		2/29/2012

Surface Water Nonradiological Data

Table C.3.7. Nonradiological Effluent Data for Landfill Surface Water Location L136 (Continued)

At the C-746-S&T Closed Landfills

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
Sulfate	mg/L	40	2		2/29/2012	
Suspended Solids	mg/L	52	40		2/29/2012	
Temperature	deg F	56.4			2/29/2012	
Total Organic Carbon	mg/L	13.6	2	D	2/29/2012	
Total Solids	mg/L	255	130		2/29/2012	
Uranium	mg/L	0.0039	0.001		2/29/2012	

Table C.3.8. Nonradiological Effluent Data for Landfill Surface Water Location L150

At the C-746-U Landfill

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
Chemical Oxygen Demand	mg/L	27	27	U	2/29/2012	
Chemical Oxygen Demand	mg/L	25	25	U	11/12/2012	
Chemical Oxygen Demand	mg/L	25	25	U	11/12/2012	Duplicate
Chloride	mg/L	5.6	2		2/29/2012	
Chloride	mg/L	2.6	2		11/12/2012	
Chloride	mg/L	2.6	2		11/12/2012	Duplicate
Conductivity	µmho/cm	229			2/29/2012	
Conductivity	µmho/cm	289			11/12/2012	
Dissolved Oxygen	mg/L	9.46			2/29/2012	
Dissolved Oxygen	mg/L	11.41			11/12/2012	
Dissolved Solids	mg/L	176	58		2/29/2012	
Dissolved Solids	mg/L	211	35		11/12/2012	
Dissolved Solids	mg/L	207	35		11/12/2012	Duplicate
Flow Rate	mgd	0.12			2/29/2012	
Flow Rate	mgd	0.01			11/12/2012	
Iron	mg/L	3.52	0.2	N	2/29/2012	
Iron	mg/L	1.75	0.2	N	11/12/2012	Duplicate
Iron	mg/L	1.84	0.2	N	11/12/2012	
pH	Std Unit	8			2/29/2012	
pH	Std Unit	8.27			11/12/2012	
Sodium	mg/L	6.19	0.1		2/29/2012	
Sodium	mg/L	3.75	0.1		11/12/2012	Duplicate
Sodium	mg/L	3.82	0.1		11/12/2012	
Sulfate	mg/L	48	2		2/29/2012	
Sulfate	mg/L	38	2		11/12/2012	
Sulfate	mg/L	38	2		11/12/2012	Duplicate
Suspended Solids	mg/L	84	27		2/29/2012	
Suspended Solids	mg/L	28	16	*	11/12/2012	
Suspended Solids	mg/L	30	16	*	11/12/2012	Duplicate
Temperature	deg F	57			2/29/2012	
Temperature	deg F	48.4			11/12/2012	
Total Organic Carbon	mg/L	7.5	2	D	2/29/2012	
Total Organic Carbon	mg/L	11.8	2	D	11/12/2012	

Surface Water Nonradiological Data

Table C.3.8. Nonradiological Effluent Data for Landfill Surface Water Location L150 (Continued)

At the C-746-U Landfill

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
Total Organic Carbon	mg/L	12	2	D	11/12/2012	Duplicate
Total Solids	mg/L	248	130		2/29/2012	
Total Solids	mg/L	260	92		11/12/2012	
Total Solids	mg/L	255	92		11/12/2012	Duplicate
Uranium	mg/L	0.0025	0.001		2/29/2012	
Uranium	mg/L	0.002	0.001		11/12/2012	
Uranium	mg/L	0.0019	0.001		11/12/2012	Duplicate

Table C.3.9. Nonradiological Effluent Data for Landfill Surface Water Location L154

Upstream of the C-746-U Landfill

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
Chemical Oxygen Demand	mg/L	37	27		2/29/2012	
Chemical Oxygen Demand	mg/L	31	25		11/12/2012	Duplicate
Chemical Oxygen Demand	mg/L	33	25		11/12/2012	
Chloride	mg/L	6.9	2		2/29/2012	
Chloride	mg/L	4.1	2		11/12/2012	Duplicate
Chloride	mg/L	4.1	2		11/12/2012	
Conductivity	µmho/cm	166			2/29/2012	
Conductivity	µmho/cm	161			11/12/2012	
Dissolved Oxygen	mg/L	9.16			2/29/2012	
Dissolved Oxygen	mg/L	9.37			11/12/2012	
Dissolved Solids	mg/L	151	87		2/29/2012	
Dissolved Solids	mg/L	155	35		11/12/2012	
Dissolved Solids	mg/L	148	35		11/12/2012	Duplicate
Flow Rate	mgd	1.51			2/29/2012	
Flow Rate	mgd	0.06			11/12/2012	
Iron	mg/L	4.63	0.2	N	2/29/2012	
Iron	mg/L	1.72	0.2	N	11/12/2012	Duplicate
Iron	mg/L	1.79	0.2	N	11/12/2012	
pH	Std Unit	8.27			2/29/2012	
pH	Std Unit	8.1			11/12/2012	
Sodium	mg/L	5.78	0.1		2/29/2012	
Sodium	mg/L	3.75	0.1		11/12/2012	
Sodium	mg/L	3.74	0.1		11/12/2012	Duplicate
Sulfate	mg/L	9.7	2		2/29/2012	
Sulfate	mg/L	8.6	2		11/12/2012	Duplicate
Sulfate	mg/L	8.8	2		11/12/2012	
Suspended Solids	mg/L	126	40		2/29/2012	
Suspended Solids	mg/L	25	16	*	11/12/2012	
Suspended Solids	mg/L	28	16	*	11/12/2012	Duplicate
Temperature	deg F	56.3			2/29/2012	
Temperature	deg F	51.5			11/12/2012	
Total Organic Carbon	mg/L	16.7	2	D	2/29/2012	

Surface Water Nonradiological Data

Table C.3.9. Nonradiological Effluent Data for Landfill Surface Water Location L154 (Continued)

Upstream of the C-746-U Landfill

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
Total Organic Carbon	mg/L	16.7	2	D	11/12/2012	
Total Organic Carbon	mg/L	17.3	2	D	11/12/2012	Duplicate
Total Solids	mg/L	256	130		2/29/2012	
Total Solids	mg/L	195	92		11/12/2012	
Total Solids	mg/L	189	92		11/12/2012	Duplicate
Uranium	mg/L	0.0057	0.001		2/29/2012	
Uranium	mg/L	0.0033	0.001		11/12/2012	
Uranium	mg/L	0.0033	0.001		11/12/2012	Duplicate

Table C.3.10. Nonradiological Effluent Data for Landfill Surface Water Location L351

Downstream of the C-746-U Landfill

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
Chemical Oxygen Demand	mg/L	40	27		2/29/2012
Chemical Oxygen Demand	mg/L	40	25		11/12/2012
Chloride	mg/L	5	2		2/29/2012
Chloride	mg/L	2.5	2		11/12/2012
Conductivity	µmho/cm	147			2/29/2012
Conductivity	µmho/cm	136			11/12/2012
Dissolved Oxygen	mg/L	10.85			2/29/2012
Dissolved Oxygen	mg/L	10.93			11/12/2012
Dissolved Solids	mg/L	147	87		2/29/2012
Dissolved Solids	mg/L	128	35		11/12/2012
Flow Rate	mgd	4.11			2/29/2012
Flow Rate	mgd	0.34			11/12/2012
Iron	mg/L	8.78	2	N	2/29/2012
Iron	mg/L	1.65	0.2	N	11/12/2012
pH	Std Unit	8.2			2/29/2012
pH	Std Unit	8.32			11/12/2012
Sodium	mg/L	4.27	0.1		2/29/2012
Sodium	mg/L	2.08	0.1		11/12/2012
Sulfate	mg/L	12	2		2/29/2012
Sulfate	mg/L	8.8	2		11/12/2012
Suspended Solids	mg/L	177	40		2/29/2012
Suspended Solids	mg/L	27	16	*	11/12/2012
Temperature	deg F	55.9			2/29/2012
Temperature	deg F	51.4			11/12/2012
Total Organic Carbon	mg/L	16.7	2	D	2/29/2012
Total Organic Carbon	mg/L	16.6	2	D	11/12/2012
Total Solids	mg/L	324	130	X	2/29/2012
Total Solids	mg/L	167	92		11/12/2012
Uranium	mg/L	0.0105	0.001		2/29/2012
Uranium	mg/L	0.0023	0.001		11/12/2012

C.4. NONRADIOLOGICAL ENVIRONMENTAL SURVEILLANCE DATA

Surface Water Nonradiological Data

Table C.4.1. Nonradiological Monitoring Data for Surface Water Location 746KTB1A

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
Alkalinity	mg/L	18			2/8/2012
Alkalinity	mg/L	30			5/7/2012
Alkalinity	mg/L	50			8/13/2012
Alkalinity	mg/L	30			11/19/2012
Conductivity	µmho/cm	138			2/8/2012
Conductivity	µmho/cm	310			5/7/2012
Conductivity	µmho/cm	335			8/13/2012
Conductivity	µmho/cm	1071			11/19/2012
Dissolved Oxygen	mg/L	9.71			2/8/2012
Dissolved Oxygen	mg/L	4.46			5/7/2012
Dissolved Oxygen	mg/L	6.82			8/13/2012
Dissolved Oxygen	mg/L	16.25			11/19/2012
Flow Rate	mgd	0.96			2/8/2012
Flow Rate	mgd	0.1			5/7/2012
Flow Rate	mgd	0			8/13/2012
Flow Rate	mgd	0.01			11/19/2012
PCB-1016	µg/L	0.17	0.17	UX	2/8/2012
PCB-1016	µg/L	0.19	0.19	U	5/7/2012
PCB-1016	µg/L	0.16	0.16	U	8/13/2012
PCB-1016	µg/L	0.17	0.17	U	11/19/2012
PCB-1221	µg/L	0.18	0.18	UX	2/8/2012
PCB-1221	µg/L	0.2	0.2	U	5/7/2012
PCB-1221	µg/L	0.17	0.17	U	8/13/2012
PCB-1221	µg/L	0.18	0.18	U	11/19/2012
PCB-1232	µg/L	0.14	0.14	UX	2/8/2012
PCB-1232	µg/L	0.15	0.15	U	5/7/2012
PCB-1232	µg/L	0.14	0.14	U	8/13/2012
PCB-1232	µg/L	0.14	0.14	U	11/19/2012
PCB-1242	µg/L	0.1	0.1	UX	2/8/2012
PCB-1242	µg/L	0.11	0.11	U	5/7/2012
PCB-1242	µg/L	0.1	0.1	U	8/13/2012
PCB-1242	µg/L	0.1	0.1	U	11/19/2012
PCB-1248	µg/L	0.12	0.12	UX	2/8/2012
PCB-1248	µg/L	0.13	0.13	U	5/7/2012
PCB-1248	µg/L	0.12	0.12	U	8/13/2012
PCB-1248	µg/L	0.12	0.12	U	11/19/2012
PCB-1254	µg/L	0.07	0.07	UX	2/8/2012
PCB-1254	µg/L	0.08	0.08	U	5/7/2012
PCB-1254	µg/L	0.07	0.07	U	8/13/2012
PCB-1254	µg/L	0.07	0.07	U	11/19/2012
PCB-1260	µg/L	0.05	0.05	UXY	2/8/2012
PCB-1260	µg/L	0.05	0.05	U	5/7/2012
PCB-1260	µg/L	0.05	0.05	U	8/13/2012
PCB-1260	µg/L	0.05	0.05	U	11/19/2012
PCB-1268	µg/L	0.09	0.09	UX	2/8/2012
PCB-1268	µg/L	0.1	0.1	U	5/7/2012

Surface Water Nonradiological Data

Table C.4.1. Nonradiological Monitoring Data for Surface Water Location 746KTB1A (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
PCB-1268	µg/L	0.09	0.09	U	8/13/2012
PCB-1268	µg/L	0.09	0.09	U	11/19/2012
pH	Std Unit	7.18			2/8/2012
pH	Std Unit	8.16			5/7/2012
pH	Std Unit	7.99			8/13/2012
pH	Std Unit	8.57			11/19/2012
PCB, Total	µg/L	0.18	0.18	UX	2/8/2012
PCB, Total	µg/L	0.2	0.2	U	5/7/2012
PCB, Total	µg/L	0.17	0.17	U	8/13/2012
PCB, Total	µg/L	0.18	0.18	U	11/19/2012
Temperature	deg F	43.8			2/8/2012
Temperature	deg F	69.5			5/7/2012
Temperature	deg F	71.3			8/13/2012
Temperature	deg F	41			11/19/2012
Trichloroethene	µg/L	1	1	U	2/8/2012
Trichloroethene	µg/L	1	1	UJ	5/7/2012
Trichloroethene	µg/L	1	1	UJY	8/13/2012
Trichloroethene	µg/L	1	1	UJ	11/19/2012

Table C.4.2. Nonradiological Monitoring Data for Surface Water Location C612

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
Alkalinity	mg/L	16			2/7/2012
Alkalinity	mg/L	30			5/2/2012
Alkalinity	mg/L	30			5/17/2012
Alkalinity	mg/L	25			8/13/2012
Alkalinity	mg/L	13.5			11/26/2012
Conductivity	µmho/cm	462			2/7/2012
Conductivity	µmho/cm	451			5/2/2012
Conductivity	µmho/cm	417			5/17/2012
Conductivity	µmho/cm	445			8/13/2012
Conductivity	µmho/cm	396			11/26/2012
Dissolved Oxygen	mg/L	9.71			2/7/2012
Dissolved Oxygen	mg/L	9.57			5/2/2012
Dissolved Oxygen	mg/L	8.96			5/17/2012
Dissolved Oxygen	mg/L	10.06			8/13/2012
Dissolved Oxygen	mg/L	9.34			11/26/2012
PCB-1016	µg/L	0.17	0.17	U	2/7/2012
PCB-1016	µg/L	0.17	0.17	U	5/2/2012
PCB-1016	µg/L	0.17	0.17	U	8/13/2012
PCB-1016	µg/L	0.17	0.17	U	11/26/2012
PCB-1221	µg/L	0.18	0.18	U	2/7/2012
PCB-1221	µg/L	0.18	0.18	U	5/2/2012
PCB-1221	µg/L	0.18	0.18	U	8/13/2012
PCB-1221	µg/L	0.18	0.18	U	11/26/2012
PCB-1232	µg/L	0.14	0.14	U	2/7/2012
PCB-1232	µg/L	0.14	0.14	U	5/2/2012

Surface Water Nonradiological Data

Table C.4.2. Nonradiological Monitoring Data for Surface Water Location C612 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
PCB-1232	µg/L	0.14	0.14	U	8/13/2012
PCB-1232	µg/L	0.14	0.14	U	11/26/2012
PCB-1242	µg/L	0.1	0.1	U	2/7/2012
PCB-1242	µg/L	0.1	0.1	U	5/2/2012
PCB-1242	µg/L	0.1	0.1	U	8/13/2012
PCB-1242	µg/L	0.1	0.1	U	11/26/2012
PCB-1248	µg/L	0.12	0.12	U	2/7/2012
PCB-1248	µg/L	0.12	0.12	U	5/2/2012
PCB-1248	µg/L	0.12	0.12	U	8/13/2012
PCB-1248	µg/L	0.12	0.12	U	11/26/2012
PCB-1254	µg/L	0.07	0.07	U	2/7/2012
PCB-1254	µg/L	0.07	0.07	U	5/2/2012
PCB-1254	µg/L	0.07	0.07	U	8/13/2012
PCB-1254	µg/L	0.07	0.07	U	11/26/2012
PCB-1260	µg/L	0.05	0.05	UY	2/7/2012
PCB-1260	µg/L	0.05	0.05	U	5/2/2012
PCB-1260	µg/L	0.05	0.05	U	8/13/2012
PCB-1260	µg/L	0.05	0.05	U	11/26/2012
PCB-1268	µg/L	0.09	0.09	U	2/7/2012
PCB-1268	µg/L	0.09	0.09	U	5/2/2012
PCB-1268	µg/L	0.09	0.09	U	8/13/2012
PCB-1268	µg/L	0.09	0.09	U	11/26/2012
pH	Std Unit	8.05			2/7/2012
pH	Std Unit	8.01			5/2/2012
pH	Std Unit	7.98			5/17/2012
pH	Std Unit	8.21			8/13/2012
pH	Std Unit	7.92			11/26/2012
PCB, Total	µg/L	0.18	0.18	U	2/7/2012
PCB, Total	µg/L	0.18	0.18	U	5/2/2012
PCB, Total	µg/L	0.18	0.18	U	8/13/2012
PCB, Total	µg/L	0.18	0.18	U	11/26/2012
Temperature	deg F	62			2/7/2012
Temperature	deg F	64.3			5/2/2012
Temperature	deg F	65.9			5/17/2012
Temperature	deg F	63.4			8/13/2012
Temperature	deg F	61.3			11/26/2012
Trichloroethene	µg/L	5.8	1		2/7/2012
Trichloroethene	µg/L	3.6	1		5/17/2012
Trichloroethene	µg/L	2.1	1	JY	8/13/2012
Trichloroethene	µg/L	1.5	1	Y	11/26/2012

Surface Water Nonradiological Data

Table C.4.3. Nonradiological Monitoring Data for Surface Water Location C616

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
Alkalinity	mg/L	13			2/7/2012	
Alkalinity	mg/L	25			5/2/2012	Duplicate
Alkalinity	mg/L	25			5/2/2012	
Alkalinity	mg/L	35			5/17/2012	
Alkalinity	mg/L	35			5/17/2012	Duplicate
Alkalinity	mg/L	35			8/13/2012	
Alkalinity	mg/L	30			11/5/2012	
Conductivity	µmho/cm	1139			2/7/2012	
Conductivity	µmho/cm	173			5/2/2012	Duplicate
Conductivity	µmho/cm	173			5/2/2012	
Conductivity	µmho/cm	182			5/17/2012	
Conductivity	µmho/cm	182			5/17/2012	Duplicate
Conductivity	µmho/cm	1640			8/13/2012	
Conductivity	µmho/cm	211			11/5/2012	
Dissolved Oxygen	mg/L	10.63			2/7/2012	
Dissolved Oxygen	mg/L	8.71			5/2/2012	
Dissolved Oxygen	mg/L	8.71			5/2/2012	Duplicate
Dissolved Oxygen	mg/L	8.62			5/17/2012	
Dissolved Oxygen	mg/L	8.62			5/17/2012	Duplicate
Dissolved Oxygen	mg/L	7.33			8/13/2012	
Dissolved Oxygen	mg/L	11.96			11/5/2012	
Flow Rate	mgd	1.61			2/7/2012	
Flow Rate	mgd	5.56			5/2/2012	
Flow Rate	mgd	5.56			5/2/2012	Duplicate
Flow Rate	mgd	1.78			5/17/2012	Duplicate
Flow Rate	mgd	1.78			5/17/2012	
Flow Rate	mgd	1.65			8/13/2012	
Flow Rate	mgd	1.11			11/5/2012	
PCB-1016	µg/L	0.17	0.17	UX	2/7/2012	
PCB-1016	µg/L	0.17	0.17	U	5/2/2012	
PCB-1016	µg/L	0.18	0.18	U	5/2/2012	Duplicate
PCB-1016	µg/L	0.17	0.17	U	8/13/2012	
PCB-1016	µg/L	0.16	0.16	U	11/5/2012	
PCB-1221	µg/L	0.18	0.18	UX	2/7/2012	
PCB-1221	µg/L	0.19	0.19	U	5/2/2012	Duplicate
PCB-1221	µg/L	0.18	0.18	U	5/2/2012	
PCB-1221	µg/L	0.18	0.18	U	8/13/2012	
PCB-1221	µg/L	0.17	0.17	U	11/5/2012	
PCB-1232	µg/L	0.14	0.14	UX	2/7/2012	
PCB-1232	µg/L	0.14	0.14	U	5/2/2012	
PCB-1232	µg/L	0.15	0.15	U	5/2/2012	Duplicate
PCB-1232	µg/L	0.14	0.14	U	8/13/2012	
PCB-1232	µg/L	0.14	0.14	U	11/5/2012	
PCB-1242	µg/L	0.1	0.1	UX	2/7/2012	
PCB-1242	µg/L	0.1	0.1	U	5/2/2012	
PCB-1242	µg/L	0.1	0.1	U	5/2/2012	Duplicate
PCB-1242	µg/L	0.1	0.1	U	8/13/2012	
PCB-1242	µg/L	0.1	0.1	U	11/5/2012	
PCB-1248	µg/L	0.12	0.12	UX	2/7/2012	

Surface Water Nonradiological Data

Table C.4.3. Nonradiological Monitoring Data for Surface Water Location C616 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
PCB-1248	µg/L	0.12	0.12	U	5/2/2012	
PCB-1248	µg/L	0.13	0.13	U	5/2/2012	Duplicate
PCB-1248	µg/L	0.12	0.12	U	8/13/2012	
PCB-1248	µg/L	0.12	0.12	U	11/5/2012	
PCB-1254	µg/L	0.07	0.07	UX	2/7/2012	
PCB-1254	µg/L	0.07	0.07	U	5/2/2012	Duplicate
PCB-1254	µg/L	0.07	0.07	U	5/2/2012	
PCB-1254	µg/L	0.07	0.07	U	8/13/2012	
PCB-1254	µg/L	0.07	0.07	U	11/5/2012	
PCB-1260	µg/L	0.05	0.05	UX	2/7/2012	
PCB-1260	µg/L	0.05	0.05	U	5/2/2012	Duplicate
PCB-1260	µg/L	0.05	0.05	U	5/2/2012	
PCB-1260	µg/L	0.05	0.05	U	8/13/2012	
PCB-1260	µg/L	0.05	0.05	UJ	11/5/2012	
PCB-1268	µg/L	0.09	0.09	UX	2/7/2012	
PCB-1268	µg/L	0.09	0.09	U	5/2/2012	Duplicate
PCB-1268	µg/L	0.09	0.09	U	5/2/2012	
PCB-1268	µg/L	0.09	0.09	U	8/13/2012	
PCB-1268	µg/L	0.09	0.09	U	11/5/2012	
pH	Std Unit	7.67			2/7/2012	
pH	Std Unit	7.48			5/2/2012	Duplicate
pH	Std Unit	7.48			5/2/2012	
pH	Std Unit	7.39			5/17/2012	
pH	Std Unit	7.39			5/17/2012	Duplicate
pH	Std Unit	8.57			8/13/2012	
pH	Std Unit	8.12			11/5/2012	
PCB, Total	µg/L	0.18	0.18	UX	2/7/2012	
PCB, Total	µg/L	0.19	0.19	U	5/2/2012	Duplicate
PCB, Total	µg/L	0.18	0.18	U	5/2/2012	
PCB, Total	µg/L	0.18	0.18	U	8/13/2012	
PCB, Total	µg/L	0.17	0.17	U	11/5/2012	
Temperature	deg F	57.2			2/7/2012	
Temperature	deg F	76.6			5/2/2012	
Temperature	deg F	76.6			5/2/2012	Duplicate
Temperature	deg F	77.3			5/17/2012	Duplicate
Temperature	deg F	77.3			5/17/2012	
Temperature	deg F	77			8/13/2012	
Temperature	deg F	62.9			11/5/2012	
Trichloroethene	µg/L	1	1	U	2/7/2012	
Trichloroethene	µg/L	1	1	U	5/17/2012	Duplicate
Trichloroethene	µg/L	1	1	U	5/17/2012	
Trichloroethene	µg/L	1	1	UJY	8/13/2012	
Trichloroethene	µg/L	1	1	U	11/5/2012	

Surface Water Nonradiological Data

Table C.4.4. Nonradiological Monitoring Data for Surface Water Location C-746-K-5

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
Alkalinity	mg/L	12			2/7/2012
Alkalinity	mg/L	20			5/2/2012
Alkalinity	mg/L	25			5/17/2012
Alkalinity	mg/L	40			8/13/2012
Alkalinity	mg/L	30			11/5/2012
Conductivity	µmho/cm	185			2/7/2012
Conductivity	µmho/cm	306			5/2/2012
Conductivity	µmho/cm	317			5/17/2012
Conductivity	µmho/cm	279			8/13/2012
Conductivity	µmho/cm	277			11/5/2012
Dissolved Oxygen	mg/L	12.64			2/7/2012
Dissolved Oxygen	mg/L	5.09			5/2/2012
Dissolved Oxygen	mg/L	6.12			5/17/2012
Dissolved Oxygen	mg/L	5.02			8/13/2012
Dissolved Oxygen	mg/L	10.03			11/5/2012
Flow Rate	mgd	3.44			2/7/2012
Flow Rate	mgd	1.66			5/2/2012
Flow Rate	mgd	0.37			5/17/2012
Flow Rate	mgd	1.29			8/13/2012
Flow Rate	mgd	0.05			11/5/2012
PCB-1016	µg/L	0.17	0.17	UX	2/7/2012
PCB-1016	µg/L	0.17	0.17	U	5/2/2012
PCB-1016	µg/L	0.17	0.17	U	8/13/2012
PCB-1016	µg/L	0.16	0.16	U	11/5/2012
PCB-1221	µg/L	0.18	0.18	UX	2/7/2012
PCB-1221	µg/L	0.18	0.18	U	5/2/2012
PCB-1221	µg/L	0.18	0.18	U	8/13/2012
PCB-1221	µg/L	0.17	0.17	U	11/5/2012
PCB-1232	µg/L	0.14	0.14	UX	2/7/2012
PCB-1232	µg/L	0.14	0.14	U	5/2/2012
PCB-1232	µg/L	0.14	0.14	U	8/13/2012
PCB-1232	µg/L	0.14	0.14	U	11/5/2012
PCB-1242	µg/L	0.1	0.1	UX	2/7/2012
PCB-1242	µg/L	0.1	0.1	U	5/2/2012
PCB-1242	µg/L	0.1	0.1	U	8/13/2012
PCB-1242	µg/L	0.1	0.1	U	11/5/2012
PCB-1248	µg/L	0.12	0.12	UX	2/7/2012
PCB-1248	µg/L	0.12	0.12	U	5/2/2012
PCB-1248	µg/L	0.12	0.12	U	8/13/2012
PCB-1248	µg/L	0.12	0.12	U	11/5/2012
PCB-1254	µg/L	0.07	0.07	UX	2/7/2012
PCB-1254	µg/L	0.07	0.07	U	5/2/2012
PCB-1254	µg/L	0.07	0.07	U	8/13/2012
PCB-1254	µg/L	0.07	0.07	U	11/5/2012
PCB-1260	µg/L	0.05	0.05	UXY	2/7/2012
PCB-1260	µg/L	0.05	0.05	U	5/2/2012
PCB-1260	µg/L	0.05	0.05	U	8/13/2012
PCB-1260	µg/L	0.05	0.05	UJ	11/5/2012
PCB-1268	µg/L	0.09	0.09	UX	2/7/2012

Surface Water Nonradiological Data

Table C.4.4. Nonradiological Monitoring Data for Surface Water Location C-746-K-5 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
PCB-1268	µg/L	0.09	0.09	U	5/2/2012
PCB-1268	µg/L	0.09	0.09	U	8/13/2012
PCB-1268	µg/L	0.09	0.09	U	11/5/2012
pH	Std Unit	8.01			2/7/2012
pH	Std Unit	7.49			5/2/2012
pH	Std Unit	7.36			5/17/2012
pH	Std Unit	7.72			8/13/2012
pH	Std Unit	8.17			11/5/2012
PCB, Total	µg/L	0.18	0.18	UX	2/7/2012
PCB, Total	µg/L	0.18	0.18	U	5/2/2012
PCB, Total	µg/L	0.18	0.18	U	8/13/2012
PCB, Total	µg/L	0.17	0.17	U	11/5/2012
Temperature	deg F	48			2/7/2012
Temperature	deg F	71			5/2/2012
Temperature	deg F	72.3			5/17/2012
Temperature	deg F	71.7			8/13/2012
Temperature	deg F	48.8			11/5/2012
Trichloroethene	µg/L	1	1	U	2/7/2012
Trichloroethene	µg/L	1	1	U	5/17/2012
Trichloroethene	µg/L	1	1	UJY	8/13/2012
Trichloroethene	µg/L	1	1	U	11/5/2012

Table C.4.5. Nonradiological Monitoring Data for Surface Water Location K001UP

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
Alkalinity	mg/L	15			2/7/2012
Alkalinity	mg/L	35			5/2/2012
Alkalinity	mg/L	30			5/17/2012
Alkalinity	mg/L	40			8/13/2012
Alkalinity	mg/L	35			11/5/2012
Conductivity	µmho/cm	1005			2/7/2012
Conductivity	µmho/cm	153			5/2/2012
Conductivity	µmho/cm	176			5/17/2012
Conductivity	µmho/cm	1326			8/13/2012
Conductivity	µmho/cm	210			11/5/2012
Dissolved Oxygen	mg/L	12.44			2/7/2012
Dissolved Oxygen	mg/L	7.62			5/2/2012
Dissolved Oxygen	mg/L	7.89			5/17/2012
Dissolved Oxygen	mg/L	4.41			8/13/2012
Dissolved Oxygen	mg/L	9.18			11/5/2012
Flow Rate	mgd	2.18			2/7/2012
Flow Rate	mgd	2.01			5/2/2012
Flow Rate	mgd	2.01			5/17/2012
Flow Rate	mgd	1.67			8/13/2012
Flow Rate	mgd	1.41			11/5/2012
PCB-1016	µg/L	0.17	0.17	U	2/7/2012
PCB-1016	µg/L	0.17	0.17	U	5/2/2012

Surface Water Nonradiological Data

Table C.4.5. Nonradiological Monitoring Data for Surface Water Location K001UP (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
PCB-1016	µg/L	0.16	0.16	U	8/13/2012
PCB-1016	µg/L	0.17	0.17	U	11/5/2012
PCB-1221	µg/L	0.18	0.18	U	2/7/2012
PCB-1221	µg/L	0.18	0.18	U	5/2/2012
PCB-1221	µg/L	0.17	0.17	U	8/13/2012
PCB-1221	µg/L	0.18	0.18	U	11/5/2012
PCB-1232	µg/L	0.14	0.14	U	2/7/2012
PCB-1232	µg/L	0.14	0.14	U	5/2/2012
PCB-1232	µg/L	0.14	0.14	U	8/13/2012
PCB-1232	µg/L	0.14	0.14	U	11/5/2012
PCB-1242	µg/L	0.1	0.1	U	2/7/2012
PCB-1242	µg/L	0.1	0.1	U	5/2/2012
PCB-1242	µg/L	0.1	0.1	U	8/13/2012
PCB-1242	µg/L	0.1	0.1	U	11/5/2012
PCB-1248	µg/L	0.12	0.12	U	2/7/2012
PCB-1248	µg/L	0.12	0.12	U	5/2/2012
PCB-1248	µg/L	0.12	0.12	U	8/13/2012
PCB-1248	µg/L	0.12	0.12	U	11/5/2012
PCB-1254	µg/L	0.07	0.07	U	2/7/2012
PCB-1254	µg/L	0.07	0.07	U	5/2/2012
PCB-1254	µg/L	0.07	0.07	U	8/13/2012
PCB-1254	µg/L	0.07	0.07	U	11/5/2012
PCB-1260	µg/L	0.05	0.05	UY	2/7/2012
PCB-1260	µg/L	0.05	0.05	U	5/2/2012
PCB-1260	µg/L	0.05	0.05	U	8/13/2012
PCB-1260	µg/L	0.05	0.05	UJ	11/5/2012
PCB-1268	µg/L	0.09	0.09	U	2/7/2012
PCB-1268	µg/L	0.09	0.09	U	5/2/2012
PCB-1268	µg/L	0.09	0.09	U	8/13/2012
PCB-1268	µg/L	0.09	0.09	U	11/5/2012
pH	Std Unit	8.55			2/7/2012
pH	Std Unit	7.63			5/2/2012
pH	Std Unit	7.56			5/17/2012
pH	Std Unit	7.51			8/13/2012
pH	Std Unit	7.9			11/5/2012
PCB, Total	µg/L	0.18	0.18	U	2/7/2012
PCB, Total	µg/L	0.18	0.18	U	5/2/2012
PCB, Total	µg/L	0.17	0.17	U	8/13/2012
PCB, Total	µg/L	0.18	0.18	U	11/5/2012
Temperature	deg F	58.6			2/7/2012
Temperature	deg F	73.1			5/2/2012
Temperature	deg F	74.6			5/17/2012
Temperature	deg F	74.8			8/13/2012
Temperature	deg F	60			11/5/2012
Trichloroethene	µg/L	1	1	U	2/7/2012
Trichloroethene	µg/L	1	1	U	5/17/2012
Trichloroethene	µg/L	1	1	UJY	8/13/2012
Trichloroethene	µg/L	1	1	U	11/5/2012

Surface Water Nonradiological Data

Table C.4.6. Nonradiological Monitoring Data for Surface Water Location L1

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
Alkalinity	mg/L	27			2/8/2012
Alkalinity	mg/L	20			5/2/2012
Alkalinity	mg/L	35			5/17/2012
Alkalinity	mg/L	35			8/13/2012
Alkalinity	mg/L	35			11/5/2012
Conductivity	µmho/cm	158			2/8/2012
Conductivity	µmho/cm	261			5/2/2012
Conductivity	µmho/cm	273			5/17/2012
Conductivity	µmho/cm	271			8/13/2012
Conductivity	µmho/cm	250			11/5/2012
Dissolved Oxygen	mg/L	9.07			2/8/2012
Dissolved Oxygen	mg/L	7.06			5/2/2012
Dissolved Oxygen	mg/L	7.96			5/17/2012
Dissolved Oxygen	mg/L	5.88			8/13/2012
Dissolved Oxygen	mg/L	13.01			11/5/2012
Flow Rate	mgd	1.56			2/8/2012
Flow Rate	mgd	0.96			5/2/2012
Flow Rate	mgd	0.62			5/17/2012
Flow Rate	mgd	0.94			8/13/2012
Flow Rate	mgd	0.13			11/5/2012
PCB-1016	µg/L	0.17	0.17	UX	2/8/2012
PCB-1016	µg/L	0.17	0.17	U	5/2/2012
PCB-1016	µg/L	0.17	0.17	U	8/13/2012
PCB-1016	µg/L	0.17	0.17	UX	11/5/2012
PCB-1221	µg/L	0.18	0.18	UX	2/8/2012
PCB-1221	µg/L	0.18	0.18	U	5/2/2012
PCB-1221	µg/L	0.18	0.18	U	8/13/2012
PCB-1221	µg/L	0.18	0.18	UX	11/5/2012
PCB-1232	µg/L	0.14	0.14	UX	2/8/2012
PCB-1232	µg/L	0.14	0.14	U	5/2/2012
PCB-1232	µg/L	0.14	0.14	U	8/13/2012
PCB-1232	µg/L	0.14	0.14	UX	11/5/2012
PCB-1242	µg/L	0.1	0.1	UX	2/8/2012
PCB-1242	µg/L	0.1	0.1	U	5/2/2012
PCB-1242	µg/L	0.1	0.1	U	8/13/2012
PCB-1242	µg/L	0.1	0.1	UX	11/5/2012
PCB-1248	µg/L	0.12	0.12	UX	2/8/2012
PCB-1248	µg/L	0.12	0.12	U	5/2/2012
PCB-1248	µg/L	0.12	0.12	U	8/13/2012
PCB-1248	µg/L	0.12	0.12	UX	11/5/2012
PCB-1254	µg/L	0.07	0.07	UX	2/8/2012
PCB-1254	µg/L	0.07	0.07	U	5/2/2012
PCB-1254	µg/L	0.07	0.07	U	8/13/2012
PCB-1254	µg/L	0.07	0.07	UX	11/5/2012
PCB-1260	µg/L	0.05	0.05	UXY	2/8/2012
PCB-1260	µg/L	0.05	0.05	U	5/2/2012
PCB-1260	µg/L	0.05	0.05	U	8/13/2012
PCB-1260	µg/L	0.05	0.05	UXJ	11/5/2012
PCB-1268	µg/L	0.09	0.09	UX	2/8/2012

Surface Water Nonradiological Data

Table C.4.6. Nonradiological Monitoring Data for Surface Water Location L1 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
PCB-1268	µg/L	0.09	0.09	U	5/2/2012
PCB-1268	µg/L	0.09	0.09	U	8/13/2012
PCB-1268	µg/L	0.09	0.09	UX	11/5/2012
pH	Std Unit	6.99			2/8/2012
pH	Std Unit	7.69			5/2/2012
pH	Std Unit	7.73			5/17/2012
pH	Std Unit	7.8			8/13/2012
pH	Std Unit	8.1			11/5/2012
PCB, Total	µg/L	0.18	0.18	UX	2/8/2012
PCB, Total	µg/L	0.18	0.18	U	5/2/2012
PCB, Total	µg/L	0.18	0.18	U	8/13/2012
PCB, Total	µg/L	0.18	0.18	UX	11/5/2012
Temperature	deg F	45			2/8/2012
Temperature	deg F	70.1			5/2/2012
Temperature	deg F	71.9			5/17/2012
Temperature	deg F	71			8/13/2012
Temperature	deg F	48.4			11/5/2012
Trichloroethene	µg/L	2	1		2/8/2012
Trichloroethene	µg/L	1	1	U	5/17/2012
Trichloroethene	µg/L	1	1	UJY	8/13/2012
Trichloroethene	µg/L	1	1	U	11/5/2012

Table C.4.7. Nonradiological Monitoring Data for Surface Water Location L5

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
Alkalinity	mg/L	22			2/8/2012
Alkalinity	mg/L	50			5/3/2012
Alkalinity	mg/L	15			8/16/2012
Alkalinity	mg/L	40			11/19/2012
Conductivity	µmho/cm	476			2/8/2012
Conductivity	µmho/cm	1093			5/3/2012
Conductivity	µmho/cm	591			8/16/2012
Conductivity	µmho/cm	1175			11/19/2012
Dissolved Oxygen	mg/L	8.15			2/8/2012
Dissolved Oxygen	mg/L	15.08			5/3/2012
Dissolved Oxygen	mg/L	8.07			8/16/2012
Dissolved Oxygen	mg/L	11.46			11/19/2012
Flow Rate	mgd	4.08			2/8/2012
Flow Rate	mgd	1.71			5/3/2012
Flow Rate	mgd	9.68			8/16/2012
Flow Rate	mgd	0.57			11/19/2012
PCB-1016	µg/L	0.17	0.17	UX	2/8/2012
PCB-1016	µg/L	0.17	0.17	U	5/3/2012
PCB-1016	µg/L	0.17	0.17	U	8/16/2012
PCB-1016	µg/L	0.18	0.18	U	11/19/2012
PCB-1221	µg/L	0.18	0.18	UX	2/8/2012
PCB-1221	µg/L	0.18	0.18	U	5/3/2012

Surface Water Nonradiological Data

Table C.4.7. Nonradiological Monitoring Data for Surface Water Location L5 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
PCB-1221	µg/L	0.18	0.18	U	8/16/2012
PCB-1221	µg/L	0.19	0.19	U	11/19/2012
PCB-1232	µg/L	0.14	0.14	UX	2/8/2012
PCB-1232	µg/L	0.14	0.14	U	5/3/2012
PCB-1232	µg/L	0.14	0.14	U	8/16/2012
PCB-1232	µg/L	0.14	0.14	U	11/19/2012
PCB-1242	µg/L	0.1	0.1	UX	2/8/2012
PCB-1242	µg/L	0.1	0.1	U	5/3/2012
PCB-1242	µg/L	0.1	0.1	U	8/16/2012
PCB-1242	µg/L	0.1	0.1	U	11/19/2012
PCB-1248	µg/L	0.12	0.12	UX	2/8/2012
PCB-1248	µg/L	0.12	0.12	U	5/3/2012
PCB-1248	µg/L	0.12	0.12	U	8/16/2012
PCB-1248	µg/L	0.12	0.12	U	11/19/2012
PCB-1254	µg/L	0.07	0.07	UX	2/8/2012
PCB-1254	µg/L	0.07	0.07	U	5/3/2012
PCB-1254	µg/L	0.07	0.07	U	8/16/2012
PCB-1254	µg/L	0.07	0.07	U	11/19/2012
PCB-1260	µg/L	0.05	0.05	UXY	2/8/2012
PCB-1260	µg/L	0.05	0.05	U	5/3/2012
PCB-1260	µg/L	0.05	0.05	U	8/16/2012
PCB-1260	µg/L	0.05	0.05	U	11/19/2012
PCB-1268	µg/L	0.09	0.09	UX	2/8/2012
PCB-1268	µg/L	0.09	0.09	U	5/3/2012
PCB-1268	µg/L	0.09	0.09	U	8/16/2012
PCB-1268	µg/L	0.09	0.09	U	11/19/2012
pH	Std Unit	7.34			2/8/2012
pH	Std Unit	7.66			5/3/2012
pH	Std Unit	7.63			8/16/2012
pH	Std Unit	8.16			11/19/2012
PCB, Total	µg/L	0.18	0.18	UX	2/8/2012
PCB, Total	µg/L	0.18	0.18	U	5/3/2012
PCB, Total	µg/L	0.18	0.18	U	8/16/2012
PCB, Total	µg/L	0.19	0.19	U	11/19/2012
Temperature	deg F	48.8			2/8/2012
Temperature	deg F	78.2			5/3/2012
Temperature	deg F	84.1			8/16/2012
Temperature	deg F	51.8			11/19/2012
Trichloroethene	µg/L	1	1	U	2/8/2012
Trichloroethene	µg/L	1	1	UY	5/3/2012
Trichloroethene	µg/L	1	1	UJY	8/16/2012
Trichloroethene	µg/L	1	1	UJ	11/19/2012

Surface Water Nonradiological Data

Table C.4.8. Nonradiological Monitoring Data for Surface Water Location L6

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
Alkalinity	mg/L	21			2/8/2012	
Alkalinity	mg/L	35			5/7/2012	
Alkalinity	mg/L	15.5			8/20/2012	
Alkalinity	mg/L	18			11/7/2012	Duplicate
Alkalinity	mg/L	18			11/7/2012	
Conductivity	µmho/cm	441			2/8/2012	
Conductivity	µmho/cm	1139			5/7/2012	
Conductivity	µmho/cm	473			8/20/2012	
Conductivity	µmho/cm	1235			11/7/2012	Duplicate
Conductivity	µmho/cm	1235			11/7/2012	
Dissolved Oxygen	mg/L	8.3			2/8/2012	
Dissolved Oxygen	mg/L	5.72			5/7/2012	
Dissolved Oxygen	mg/L	9.06			8/20/2012	
Dissolved Oxygen	mg/L	9.32			11/7/2012	
Dissolved Oxygen	mg/L	9.32			11/7/2012	Duplicate
Flow Rate	mgd	9.09			2/8/2012	
Flow Rate	mgd	1.2			5/7/2012	
Flow Rate	mgd	7.55			8/20/2012	
Flow Rate	mgd	4.43			11/7/2012	Duplicate
Flow Rate	mgd	4.43			11/7/2012	
PCB-1016	µg/L	0.17	0.17	U	2/8/2012	
PCB-1016	µg/L	0.18	0.18	U	5/7/2012	
PCB-1016	µg/L	0.16	0.16	U	8/20/2012	
PCB-1016	µg/L	0.17	0.17	UY	11/7/2012	Duplicate
PCB-1016	µg/L	0.17	0.17	UY	11/7/2012	
PCB-1221	µg/L	0.18	0.18	U	2/8/2012	
PCB-1221	µg/L	0.19	0.19	U	5/7/2012	
PCB-1221	µg/L	0.17	0.17	U	8/20/2012	
PCB-1221	µg/L	0.18	0.18	UY	11/7/2012	Duplicate
PCB-1221	µg/L	0.18	0.18	UY	11/7/2012	
PCB-1232	µg/L	0.14	0.14	U	2/8/2012	
PCB-1232	µg/L	0.15	0.15	U	5/7/2012	
PCB-1232	µg/L	0.14	0.14	U	8/20/2012	
PCB-1232	µg/L	0.14	0.14	UY	11/7/2012	
PCB-1232	µg/L	0.14	0.14	UY	11/7/2012	Duplicate
PCB-1242	µg/L	0.1	0.1	U	2/8/2012	
PCB-1242	µg/L	0.11	0.11	U	5/7/2012	
PCB-1242	µg/L	0.1	0.1	U	8/20/2012	
PCB-1242	µg/L	0.1	0.1	UY	11/7/2012	
PCB-1242	µg/L	0.1	0.1	UY	11/7/2012	Duplicate
PCB-1248	µg/L	0.12	0.12	U	2/8/2012	
PCB-1248	µg/L	0.13	0.13	U	5/7/2012	
PCB-1248	µg/L	0.12	0.12	U	8/20/2012	
PCB-1248	µg/L	0.12	0.12	UY	11/7/2012	Duplicate
PCB-1248	µg/L	0.12	0.12	UY	11/7/2012	
PCB-1254	µg/L	0.07	0.07	U	2/8/2012	
PCB-1254	µg/L	0.07	0.07	U	5/7/2012	
PCB-1254	µg/L	0.07	0.07	U	8/20/2012	
PCB-1254	µg/L	0.07	0.07	UY	11/7/2012	Duplicate

Surface Water Nonradiological Data

Table C.4.8. Nonradiological Monitoring Data for Surface Water Location L6 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
PCB-1254	µg/L	0.07	0.07	UY	11/7/2012	
PCB-1260	µg/L	0.05	0.05	UY	2/8/2012	
PCB-1260	µg/L	0.05	0.05	U	5/7/2012	
PCB-1260	µg/L	0.05	0.05	U	8/20/2012	
PCB-1260	µg/L	0.05	0.05	UYJ	11/7/2012	Duplicate
PCB-1260	µg/L	0.05	0.05	UYJ	11/7/2012	
PCB-1268	µg/L	0.09	0.09	U	2/8/2012	
PCB-1268	µg/L	0.1	0.1	U	5/7/2012	
PCB-1268	µg/L	0.09	0.09	U	8/20/2012	
PCB-1268	µg/L	0.09	0.09	UY	11/7/2012	
PCB-1268	µg/L	0.09	0.09	UY	11/7/2012	Duplicate
pH	Std Unit	7.34			2/8/2012	
pH	Std Unit	7.58			5/7/2012	
pH	Std Unit	7.57			8/20/2012	
pH	Std Unit	7.8			11/7/2012	
pH	Std Unit	7.8			11/7/2012	Duplicate
PCB, Total	µg/L	0.18	0.18	U	2/8/2012	
PCB, Total	µg/L	0.19	0.19	U	5/7/2012	
PCB, Total	µg/L	0.17	0.17	U	8/20/2012	
PCB, Total	µg/L	0.18	0.18	UY	11/7/2012	Duplicate
PCB, Total	µg/L	0.18	0.18	UY	11/7/2012	
Temperature	deg F	47.8			2/8/2012	
Temperature	deg F	75.2			5/7/2012	
Temperature	deg F	81.6			8/20/2012	
Temperature	deg F	53.8			11/7/2012	
Temperature	deg F	53.8			11/7/2012	Duplicate
Trichloroethene	µg/L	1	1	U	2/8/2012	
Trichloroethene	µg/L	1	1	UJ	5/7/2012	
Trichloroethene	µg/L	1	1	UJY	8/20/2012	
Trichloroethene	µg/L	1	1	U	11/7/2012	Duplicate
Trichloroethene	µg/L	1	1	U	11/7/2012	

Table C.4.9. Nonradiological Monitoring Data for Surface Water Location L10

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
Alkalinity	mg/L	13			2/9/2012
Alkalinity	mg/L	35			5/7/2012
Alkalinity	mg/L	16			8/20/2012
Alkalinity	mg/L	35			11/28/2012
Conductivity	µmho/cm	364			2/9/2012
Conductivity	µmho/cm	598			5/7/2012
Conductivity	µmho/cm	382			8/20/2012
Conductivity	µmho/cm	527			11/28/2012
Dissolved Oxygen	mg/L	14.12			2/9/2012
Dissolved Oxygen	mg/L	7.65			5/7/2012
Dissolved Oxygen	mg/L	6.92			8/20/2012
Dissolved Oxygen	mg/L	25.82			11/28/2012

Surface Water Nonradiological Data

Table C.4.9. Nonradiological Monitoring Data for Surface Water Location L10 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
Flow Rate	mgd	8.87			2/9/2012
Flow Rate	mgd	0.39			5/7/2012
Flow Rate	mgd	1.3			8/20/2012
Flow Rate	mgd	0.47			11/28/2012
PCB-1016	µg/L	0.17	0.17	U	2/9/2012
PCB-1016	µg/L	0.17	0.17	U	5/7/2012
PCB-1016	µg/L	0.17	0.17	U	8/20/2012
PCB-1016	µg/L	0.16	0.16	UY	11/28/2012
PCB-1221	µg/L	0.18	0.18	U	2/9/2012
PCB-1221	µg/L	0.18	0.18	U	5/7/2012
PCB-1221	µg/L	0.18	0.18	U	8/20/2012
PCB-1221	µg/L	0.17	0.17	UY	11/28/2012
PCB-1232	µg/L	0.14	0.14	U	2/9/2012
PCB-1232	µg/L	0.14	0.14	U	5/7/2012
PCB-1232	µg/L	0.14	0.14	U	8/20/2012
PCB-1232	µg/L	0.14	0.14	UY	11/28/2012
PCB-1242	µg/L	0.1	0.1	U	2/9/2012
PCB-1242	µg/L	0.1	0.1	U	5/7/2012
PCB-1242	µg/L	0.1	0.1	U	8/20/2012
PCB-1242	µg/L	0.1	0.1	UY	11/28/2012
PCB-1248	µg/L	0.12	0.12	U	2/9/2012
PCB-1248	µg/L	0.12	0.12	U	5/7/2012
PCB-1248	µg/L	0.12	0.12	U	8/20/2012
PCB-1248	µg/L	0.12	0.12	UY	11/28/2012
PCB-1254	µg/L	0.07	0.07	U	2/9/2012
PCB-1254	µg/L	0.07	0.07	U	5/7/2012
PCB-1254	µg/L	0.07	0.07	U	8/20/2012
PCB-1254	µg/L	0.07	0.07	UY	11/28/2012
PCB-1260	µg/L	0.05	0.05	U	2/9/2012
PCB-1260	µg/L	0.05	0.05	U	5/7/2012
PCB-1260	µg/L	0.05	0.05	U	8/20/2012
PCB-1260	µg/L	0.05	0.05	UY	11/28/2012
PCB-1268	µg/L	0.09	0.09	U	2/9/2012
PCB-1268	µg/L	0.09	0.09	U	5/7/2012
PCB-1268	µg/L	0.09	0.09	U	8/20/2012
PCB-1268	µg/L	0.09	0.09	UY	11/28/2012
pH	Std Unit	8.03			2/9/2012
pH	Std Unit	8.04			5/7/2012
pH	Std Unit	7.3			8/20/2012
pH	Std Unit	8.36			11/28/2012
PCB, Total	µg/L	0.18	0.18	U	2/9/2012
PCB, Total	µg/L	0.18	0.18	U	5/7/2012
PCB, Total	µg/L	0.18	0.18	U	8/20/2012
PCB, Total	µg/L	0.17	0.17	UY	11/28/2012
Temperature	deg F	48.1			2/9/2012
Temperature	deg F	76.5			5/7/2012
Temperature	deg F	76			8/20/2012
Temperature	deg F	42.3			11/28/2012
Trichloroethene	µg/L	1	1	U	2/9/2012

Surface Water Nonradiological Data

Table C.4.9. Nonradiological Monitoring Data for Surface Water Location L10 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
Trichloroethene	µg/L	1	1	UJ	5/7/2012
Trichloroethene	µg/L	1	1	UJY	8/20/2012
Trichloroethene	µg/L	1	1	U	11/28/2012

Table C.4.10. Nonradiological Monitoring Data for Surface Water Location L11

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
Alkalinity	mg/L	27			2/8/2012
Alkalinity	mg/L	45			5/3/2012
Alkalinity	mg/L	13			8/20/2012
Alkalinity	mg/L	19			11/7/2012
Conductivity	µmho/cm	227			2/8/2012
Conductivity	µmho/cm	547			5/3/2012
Conductivity	µmho/cm	404			8/20/2012
Conductivity	µmho/cm	612			11/7/2012
Dissolved Oxygen	mg/L	9.36			2/8/2012
Dissolved Oxygen	mg/L	11.08			5/3/2012
Dissolved Oxygen	mg/L	9.81			8/20/2012
Dissolved Oxygen	mg/L	7.82			11/7/2012
Flow Rate	mgd	0.9			2/8/2012
Flow Rate	mgd	2.46			5/3/2012
Flow Rate	mgd	2.83			8/20/2012
Flow Rate	mgd	0.59			11/7/2012
PCB-1016	µg/L	0.17	0.17	UX	2/8/2012
PCB-1016	µg/L	0.17	0.17	U	5/3/2012
PCB-1016	µg/L	0.17	0.17	U	8/20/2012
PCB-1016	µg/L	0.17	0.17	UY	11/7/2012
PCB-1221	µg/L	0.18	0.18	UX	2/8/2012
PCB-1221	µg/L	0.18	0.18	U	5/3/2012
PCB-1221	µg/L	0.18	0.18	U	8/20/2012
PCB-1221	µg/L	0.18	0.18	UY	11/7/2012
PCB-1232	µg/L	0.14	0.14	UX	2/8/2012
PCB-1232	µg/L	0.14	0.14	U	5/3/2012
PCB-1232	µg/L	0.14	0.14	U	8/20/2012
PCB-1232	µg/L	0.14	0.14	UY	11/7/2012
PCB-1242	µg/L	0.1	0.1	UX	2/8/2012
PCB-1242	µg/L	0.1	0.1	U	5/3/2012
PCB-1242	µg/L	0.1	0.1	U	8/20/2012
PCB-1242	µg/L	0.1	0.1	UY	11/7/2012
PCB-1248	µg/L	0.12	0.12	UX	2/8/2012
PCB-1248	µg/L	0.12	0.12	U	5/3/2012
PCB-1248	µg/L	0.12	0.12	U	8/20/2012
PCB-1248	µg/L	0.12	0.12	UY	11/7/2012
PCB-1254	µg/L	0.07	0.07	UX	2/8/2012
PCB-1254	µg/L	0.07	0.07	U	5/3/2012
PCB-1254	µg/L	0.07	0.07	U	8/20/2012
PCB-1254	µg/L	0.07	0.07	UY	11/7/2012

Surface Water Nonradiological Data

Table C.4.10. Nonradiological Monitoring Data for Surface Water Location L11 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
PCB-1260	µg/L	0.05	0.05	UX	2/8/2012
PCB-1260	µg/L	0.05	0.05	U	5/3/2012
PCB-1260	µg/L	0.05	0.05	U	8/20/2012
PCB-1260	µg/L	0.05	0.05	UYJ	11/7/2012
PCB-1268	µg/L	0.09	0.09	UX	2/8/2012
PCB-1268	µg/L	0.09	0.09	U	5/3/2012
PCB-1268	µg/L	0.09	0.09	U	8/20/2012
PCB-1268	µg/L	0.09	0.09	UY	11/7/2012
pH	Std Unit	7.44			2/8/2012
pH	Std Unit	7.76			5/3/2012
pH	Std Unit	7.21			8/20/2012
pH	Std Unit	7.27			11/7/2012
PCB, Total	µg/L	0.18	0.18	UX	2/8/2012
PCB, Total	µg/L	0.18	0.18	U	5/3/2012
PCB, Total	µg/L	0.18	0.18	U	8/20/2012
PCB, Total	µg/L	0.18	0.18	UY	11/7/2012
Temperature	deg F	44.7			2/8/2012
Temperature	deg F	74.6			5/3/2012
Temperature	deg F	77.3			8/20/2012
Temperature	deg F	48.8			11/7/2012
Trichloroethene	µg/L	1	1	U	2/8/2012
Trichloroethene	µg/L	1	1	UY	5/3/2012
Trichloroethene	µg/L	1	1	UJY	8/20/2012
Trichloroethene	µg/L	1	1	U	11/7/2012

Table C.4.11. Nonradiological Monitoring Data for Surface Water Location L12

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
Alkalinity	mg/L	13			2/20/2012	Duplicate
Alkalinity	mg/L	13			2/20/2012	
Alkalinity	mg/L	40			5/3/2012	
Alkalinity	mg/L	35			8/16/2012	
Alkalinity	mg/L	40			11/28/2012	
Conductivity	µmho/cm	341			2/20/2012	Duplicate
Conductivity	µmho/cm	341			2/20/2012	
Conductivity	µmho/cm	464			5/3/2012	
Conductivity	µmho/cm	403			8/16/2012	
Conductivity	µmho/cm	571			11/28/2012	
Dissolved Oxygen	mg/L	10.75			2/20/2012	
Dissolved Oxygen	mg/L	10.75			2/20/2012	Duplicate
Dissolved Oxygen	mg/L	38.33			5/3/2012	
Dissolved Oxygen	mg/L	10.13			8/16/2012	
Dissolved Oxygen	mg/L	26.69			11/28/2012	
Flow Rate	mgd	2.04			2/20/2012	
Flow Rate	mgd	2.04			2/20/2012	Duplicate
Flow Rate	mgd	1.81			5/3/2012	
Flow Rate	mgd	2.66			8/16/2012	

Surface Water Nonradiological Data

Table C.4.11. Nonradiological Monitoring Data for Surface Water Location L12 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
Flow Rate	mgd	0.24			11/28/2012	
PCB-1016	µg/L	0.17	0.17	UX	2/20/2012	Duplicate
PCB-1016	µg/L	0.17	0.17	UX	2/20/2012	
PCB-1016	µg/L	0.17	0.17	U	5/3/2012	
PCB-1016	µg/L	0.17	0.17	U	8/16/2012	
PCB-1016	µg/L	0.17	0.17	UY	11/28/2012	
PCB-1221	µg/L	0.18	0.18	UX	2/20/2012	
PCB-1221	µg/L	0.18	0.18	UX	2/20/2012	Duplicate
PCB-1221	µg/L	0.18	0.18	U	5/3/2012	
PCB-1221	µg/L	0.18	0.18	U	8/16/2012	
PCB-1221	µg/L	0.18	0.18	UY	11/28/2012	
PCB-1232	µg/L	0.14	0.14	UX	2/20/2012	
PCB-1232	µg/L	0.14	0.14	UX	2/20/2012	Duplicate
PCB-1232	µg/L	0.14	0.14	U	5/3/2012	
PCB-1232	µg/L	0.14	0.14	U	8/16/2012	
PCB-1232	µg/L	0.14	0.14	UY	11/28/2012	
PCB-1242	µg/L	0.1	0.1	UX	2/20/2012	Duplicate
PCB-1242	µg/L	0.1	0.1	UX	2/20/2012	
PCB-1242	µg/L	0.1	0.1	U	5/3/2012	
PCB-1242	µg/L	0.1	0.1	U	8/16/2012	
PCB-1242	µg/L	0.1	0.1	UY	11/28/2012	
PCB-1248	µg/L	0.12	0.12	UX	2/20/2012	
PCB-1248	µg/L	0.12	0.12	UX	2/20/2012	Duplicate
PCB-1248	µg/L	0.12	0.12	U	5/3/2012	
PCB-1248	µg/L	0.12	0.12	U	8/16/2012	
PCB-1248	µg/L	0.12	0.12	UY	11/28/2012	
PCB-1254	µg/L	0.07	0.07	UX	2/20/2012	Duplicate
PCB-1254	µg/L	0.07	0.07	UX	2/20/2012	
PCB-1254	µg/L	0.07	0.07	U	5/3/2012	
PCB-1254	µg/L	0.07	0.07	U	8/16/2012	
PCB-1254	µg/L	0.07	0.07	UY	11/28/2012	
PCB-1260	µg/L	0.05	0.05	UXY	2/20/2012	Duplicate
PCB-1260	µg/L	0.05	0.05	UXY	2/20/2012	
PCB-1260	µg/L	0.05	0.05	U	5/3/2012	
PCB-1260	µg/L	0.05	0.05	U	8/16/2012	
PCB-1260	µg/L	0.05	0.05	UY	11/28/2012	
PCB-1268	µg/L	0.09	0.09	UX	2/20/2012	
PCB-1268	µg/L	0.09	0.09	UX	2/20/2012	Duplicate
PCB-1268	µg/L	0.09	0.09	U	5/3/2012	
PCB-1268	µg/L	0.09	0.09	U	8/16/2012	
PCB-1268	µg/L	0.09	0.09	UY	11/28/2012	
pH	Std Unit	7.09			2/20/2012	Duplicate
pH	Std Unit	7.09			2/20/2012	
pH	Std Unit	7.87			5/3/2012	
pH	Std Unit	7.19			8/16/2012	
pH	Std Unit	8.45			11/28/2012	
PCB, Total	µg/L	0.18	0.18	UX	2/20/2012	
PCB, Total	µg/L	0.18	0.18	UX	2/20/2012	Duplicate
PCB, Total	µg/L	0.18	0.18	U	5/3/2012	

Surface Water Nonradiological Data

Table C.4.11. Nonradiological Monitoring Data for Surface Water Location L12 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
PCB, Total	µg/L	0.18	0.18	U	8/16/2012	
PCB, Total	µg/L	0.18	0.18	UY	11/28/2012	
Temperature	deg F	56.2			2/20/2012	Duplicate
Temperature	deg F	56.2			2/20/2012	
Temperature	deg F	71.9			5/3/2012	
Temperature	deg F	76			8/16/2012	
Temperature	deg F	45.1			11/28/2012	
Trichloroethene	µg/L	1.6	1	X	2/20/2012	
Trichloroethene	µg/L	1.8	1	X	2/20/2012	Duplicate
Trichloroethene	µg/L	1.3	1	Y	5/3/2012	
Trichloroethene	µg/L	1	1	UJY	8/16/2012	
Trichloroethene	µg/L	1	1	U	11/28/2012	

Table C.4.12. Nonradiological Monitoring Data for Surface Water Location L29A

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
Alkalinity	mg/L	18			2/20/2012
Alkalinity	mg/L	50			5/3/2012
Alkalinity	mg/L	40			8/16/2012
Alkalinity	mg/L	35			11/7/2012
Conductivity	µmho/cm	183			2/20/2012
Conductivity	µmho/cm	363			5/3/2012
Conductivity	µmho/cm	312			8/16/2012
Conductivity	µmho/cm	378			11/7/2012
Dissolved Oxygen	mg/L	12.06			2/20/2012
Dissolved Oxygen	mg/L	7.01			5/3/2012
Dissolved Oxygen	mg/L	6.59			8/16/2012
Dissolved Oxygen	mg/L	9.46			11/7/2012
PCB-1016	µg/L	0.17	0.17	UX	2/20/2012
PCB-1016	µg/L	0.17	0.17	U	5/3/2012
PCB-1016	µg/L	0.17	0.17	U	8/16/2012
PCB-1016	µg/L	0.17	0.17	UY	11/7/2012
PCB-1221	µg/L	0.18	0.18	UX	2/20/2012
PCB-1221	µg/L	0.18	0.18	U	5/3/2012
PCB-1221	µg/L	0.18	0.18	U	8/16/2012
PCB-1221	µg/L	0.18	0.18	UY	11/7/2012
PCB-1232	µg/L	0.14	0.14	UX	2/20/2012
PCB-1232	µg/L	0.14	0.14	U	5/3/2012
PCB-1232	µg/L	0.14	0.14	U	8/16/2012
PCB-1232	µg/L	0.14	0.14	UY	11/7/2012
PCB-1242	µg/L	0.1	0.1	UX	2/20/2012
PCB-1242	µg/L	0.1	0.1	U	5/3/2012
PCB-1242	µg/L	0.1	0.1	U	8/16/2012
PCB-1242	µg/L	0.1	0.1	UY	11/7/2012
PCB-1248	µg/L	0.12	0.12	UX	2/20/2012
PCB-1248	µg/L	0.12	0.12	U	5/3/2012
PCB-1248	µg/L	0.12	0.12	U	8/16/2012

Surface Water Nonradiological Data

Table C.4.12. Nonradiological Monitoring Data for Surface Water Location L29A (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
PCB-1248	µg/L	0.12	0.12	UY	11/7/2012
PCB-1254	µg/L	0.07	0.07	UX	2/20/2012
PCB-1254	µg/L	0.07	0.07	U	5/3/2012
PCB-1254	µg/L	0.07	0.07	U	8/16/2012
PCB-1254	µg/L	0.07	0.07	UY	11/7/2012
PCB-1260	µg/L	0.05	0.05	UXY	2/20/2012
PCB-1260	µg/L	0.05	0.05	U	5/3/2012
PCB-1260	µg/L	0.05	0.05	U	8/16/2012
PCB-1260	µg/L	0.05	0.05	UYJ	11/7/2012
PCB-1268	µg/L	0.09	0.09	UX	2/20/2012
PCB-1268	µg/L	0.09	0.09	U	5/3/2012
PCB-1268	µg/L	0.09	0.09	U	8/16/2012
PCB-1268	µg/L	0.09	0.09	UY	11/7/2012
pH	Std Unit	7.19			2/20/2012
pH	Std Unit	8.15			5/3/2012
pH	Std Unit	7.92			8/16/2012
pH	Std Unit	8.25			11/7/2012
PCB, Total	µg/L	0.18	0.18	UX	2/20/2012
PCB, Total	µg/L	0.18	0.18	U	5/3/2012
PCB, Total	µg/L	0.18	0.18	U	8/16/2012
PCB, Total	µg/L	0.18	0.18	UY	11/7/2012
Temperature	deg F	47.9			2/20/2012
Temperature	deg F	70.3			5/3/2012
Temperature	deg F	88.6			8/16/2012
Temperature	deg F	54.9			11/7/2012
Trichloroethene	µg/L	1	1	UX	2/20/2012
Trichloroethene	µg/L	1	1	UY	5/3/2012
Trichloroethene	µg/L	1	1	UJY	8/16/2012
Trichloroethene	µg/L	1	1	U	11/7/2012

Table C.4.13. Nonradiological Monitoring Data for Surface Water Location L30

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
Alkalinity	mg/L	13.5			2/21/2012
Alkalinity	mg/L	30			5/3/2012
Alkalinity	mg/L	17			8/16/2012
Alkalinity	mg/L	27			11/7/2012
Conductivity	µmho/cm	181			2/21/2012
Conductivity	µmho/cm	368			5/3/2012
Conductivity	µmho/cm	290			8/16/2012
Conductivity	µmho/cm	381			11/7/2012
Dissolved Oxygen	mg/L	12.19			2/21/2012
Dissolved Oxygen	mg/L	7.55			5/3/2012
Dissolved Oxygen	mg/L	7.24			8/16/2012
Dissolved Oxygen	mg/L	9.26			11/7/2012
PCB-1016	µg/L	0.17	0.17	UY	2/21/2012
PCB-1016	µg/L	0.17	0.17	U	5/3/2012

Surface Water Nonradiological Data

Table C.4.13. Nonradiological Monitoring Data for Surface Water Location L30 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
PCB-1016	µg/L	0.17	0.17	U	8/16/2012
PCB-1016	µg/L	0.17	0.17	UY	11/7/2012
PCB-1221	µg/L	0.18	0.18	UY	2/21/2012
PCB-1221	µg/L	0.18	0.18	U	5/3/2012
PCB-1221	µg/L	0.18	0.18	U	8/16/2012
PCB-1221	µg/L	0.18	0.18	UY	11/7/2012
PCB-1232	µg/L	0.14	0.14	UY	2/21/2012
PCB-1232	µg/L	0.14	0.14	U	5/3/2012
PCB-1232	µg/L	0.14	0.14	U	8/16/2012
PCB-1232	µg/L	0.14	0.14	UY	11/7/2012
PCB-1242	µg/L	0.1	0.1	UY	2/21/2012
PCB-1242	µg/L	0.1	0.1	U	5/3/2012
PCB-1242	µg/L	0.1	0.1	U	8/16/2012
PCB-1242	µg/L	0.1	0.1	UY	11/7/2012
PCB-1248	µg/L	0.12	0.12	UY	2/21/2012
PCB-1248	µg/L	0.12	0.12	U	5/3/2012
PCB-1248	µg/L	0.12	0.12	U	8/16/2012
PCB-1248	µg/L	0.12	0.12	UY	11/7/2012
PCB-1254	µg/L	0.07	0.07	UY	2/21/2012
PCB-1254	µg/L	0.07	0.07	U	5/3/2012
PCB-1254	µg/L	0.07	0.07	U	8/16/2012
PCB-1254	µg/L	0.07	0.07	UY	11/7/2012
PCB-1260	µg/L	0.05	0.05	UY	2/21/2012
PCB-1260	µg/L	0.05	0.05	U	5/3/2012
PCB-1260	µg/L	0.05	0.05	U	8/16/2012
PCB-1260	µg/L	0.05	0.05	UYJ	11/7/2012
PCB-1268	µg/L	0.09	0.09	UY	2/21/2012
PCB-1268	µg/L	0.09	0.09	U	5/3/2012
PCB-1268	µg/L	0.09	0.09	U	8/16/2012
PCB-1268	µg/L	0.09	0.09	UY	11/7/2012
pH	Std Unit	7.85			2/21/2012
pH	Std Unit	8.12			5/3/2012
pH	Std Unit	7.7			8/16/2012
pH	Std Unit	7.96			11/7/2012
PCB, Total	µg/L	0.18	0.18	UY	2/21/2012
PCB, Total	µg/L	0.18	0.18	U	5/3/2012
PCB, Total	µg/L	0.18	0.18	U	8/16/2012
PCB, Total	µg/L	0.18	0.18	UY	11/7/2012
Temperature	deg F	48.7			2/21/2012
Temperature	deg F	71.4			5/3/2012
Temperature	deg F	83.4			8/16/2012
Temperature	deg F	56.9			11/7/2012
Trichloroethene	µg/L	1	1	UX	2/21/2012
Trichloroethene	µg/L	1	1	UY	5/3/2012
Trichloroethene	µg/L	1	1	UJY	8/16/2012
Trichloroethene	µg/L	1	1	U	11/7/2012

Surface Water Nonradiological Data

Table C.4.14. Nonradiological Monitoring Data for Surface Water Location L64

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
Alkalinity	mg/L	25			2/8/2012
Alkalinity	mg/L	35			5/7/2012
Alkalinity	mg/L	35			8/13/2012
Alkalinity	mg/L	35			11/5/2012
Conductivity	µmho/cm	149			2/8/2012
Conductivity	µmho/cm	161			5/7/2012
Conductivity	µmho/cm	158			8/13/2012
Conductivity	µmho/cm	170			11/5/2012
Dissolved Oxygen	mg/L	9.55			2/8/2012
Dissolved Oxygen	mg/L	5.16			5/7/2012
Dissolved Oxygen	mg/L	8.24			8/13/2012
Dissolved Oxygen	mg/L	12.03			11/5/2012
Flow Rate	mgd	2.27			2/8/2012
Flow Rate	mgd	0.38			5/7/2012
Flow Rate	mgd	0.59			8/13/2012
Flow Rate	mgd	0.06			11/5/2012
PCB-1016	µg/L	0.17	0.17	U	2/8/2012
PCB-1016	µg/L	0.19	0.19	U	5/7/2012
PCB-1016	µg/L	0.17	0.17	U	8/13/2012
PCB-1016	µg/L	0.17	0.17	U	11/5/2012
PCB-1221	µg/L	0.18	0.18	U	2/8/2012
PCB-1221	µg/L	0.2	0.2	U	5/7/2012
PCB-1221	µg/L	0.18	0.18	U	8/13/2012
PCB-1221	µg/L	0.18	0.18	U	11/5/2012
PCB-1232	µg/L	0.14	0.14	U	2/8/2012
PCB-1232	µg/L	0.16	0.16	U	5/7/2012
PCB-1232	µg/L	0.14	0.14	U	8/13/2012
PCB-1232	µg/L	0.14	0.14	U	11/5/2012
PCB-1242	µg/L	0.1	0.1	U	2/8/2012
PCB-1242	µg/L	0.11	0.11	U	5/7/2012
PCB-1242	µg/L	0.1	0.1	U	8/13/2012
PCB-1242	µg/L	0.1	0.1	U	11/5/2012
PCB-1248	µg/L	0.12	0.12	U	2/8/2012
PCB-1248	µg/L	0.13	0.13	U	5/7/2012
PCB-1248	µg/L	0.12	0.12	U	8/13/2012
PCB-1248	µg/L	0.12	0.12	U	11/5/2012
PCB-1254	µg/L	0.07	0.07	U	2/8/2012
PCB-1254	µg/L	0.08	0.08	U	5/7/2012
PCB-1254	µg/L	0.07	0.07	U	8/13/2012
PCB-1254	µg/L	0.07	0.07	U	11/5/2012
PCB-1260	µg/L	0.05	0.05	U	2/8/2012
PCB-1260	µg/L	0.06	0.06	U	5/7/2012
PCB-1260	µg/L	0.05	0.05	U	8/13/2012
PCB-1260	µg/L	0.05	0.05	UJ	11/5/2012
PCB-1268	µg/L	0.09	0.09	U	2/8/2012
PCB-1268	µg/L	0.1	0.1	U	5/7/2012
PCB-1268	µg/L	0.09	0.09	U	8/13/2012
PCB-1268	µg/L	0.09	0.09	U	11/5/2012
pH	Std Unit	7.4			2/8/2012

Surface Water Nonradiological Data

Table C.4.14. Nonradiological Monitoring Data for Surface Water Location L64 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
pH	Std Unit	8.09			5/7/2012	
pH	Std Unit	7.61			8/13/2012	
pH	Std Unit	7.87			11/5/2012	
PCB, Total	µg/L	0.18	0.18	U	2/8/2012	
PCB, Total	µg/L	0.2	0.2	U	5/7/2012	
PCB, Total	µg/L	0.18	0.18	U	8/13/2012	
PCB, Total	µg/L	0.18	0.18	U	11/5/2012	
Temperature	deg F	45.4			2/8/2012	
Temperature	deg F	73.8			5/7/2012	
Temperature	deg F	74.4			8/13/2012	
Temperature	deg F	49.6			11/5/2012	
Trichloroethene	µg/L	1	1	U	2/8/2012	
Trichloroethene	µg/L	1	1	UJ	5/7/2012	
Trichloroethene	µg/L	1	1	UJY	8/13/2012	
Trichloroethene	µg/L	1	1	U	11/5/2012	

Table C.4.15. Nonradiological Monitoring Data for Surface Water Location L194

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
Alkalinity	mg/L	15			2/9/2012	
Alkalinity	mg/L	30			5/7/2012	
Alkalinity	mg/L	17			8/20/2012	
Alkalinity	mg/L	17			8/20/2012	Duplicate
Alkalinity	mg/L	30			11/28/2012	
Conductivity	µmho/cm	402			2/9/2012	
Conductivity	µmho/cm	616			5/7/2012	
Conductivity	µmho/cm	383			8/20/2012	
Conductivity	µmho/cm	383			8/20/2012	Duplicate
Conductivity	µmho/cm	618			11/28/2012	
Dissolved Oxygen	mg/L	12.09			2/9/2012	
Dissolved Oxygen	mg/L	5.59			5/7/2012	
Dissolved Oxygen	mg/L	6.07			8/20/2012	
Dissolved Oxygen	mg/L	6.07			8/20/2012	Duplicate
Dissolved Oxygen	mg/L	16.91			11/28/2012	
Flow Rate	mgd	1.04			2/9/2012	
Flow Rate	mgd	0.3			5/7/2012	
Flow Rate	mgd	1.86			8/20/2012	Duplicate
Flow Rate	mgd	1.86			8/20/2012	
Flow Rate	mgd	0.12			11/28/2012	
PCB-1016	µg/L	0.17	0.17	U	2/9/2012	
PCB-1016	µg/L	0.18	0.18	U	5/7/2012	
PCB-1016	µg/L	0.17	0.17	U	8/20/2012	
PCB-1016	µg/L	0.17	0.17	U	8/20/2012	Duplicate
PCB-1016	µg/L	0.16	0.16	UY	11/28/2012	
PCB-1221	µg/L	0.18	0.18	U	2/9/2012	
PCB-1221	µg/L	0.19	0.19	U	5/7/2012	
PCB-1221	µg/L	0.18	0.18	U	8/20/2012	

Surface Water Nonradiological Data

Table C.4.15. Nonradiological Monitoring Data for Surface Water Location L194 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
PCB-1221	µg/L	0.18	0.18	U	8/20/2012	Duplicate
PCB-1221	µg/L	0.17	0.17	UY	11/28/2012	
PCB-1232	µg/L	0.14	0.14	U	2/9/2012	
PCB-1232	µg/L	0.15	0.15	U	5/7/2012	
PCB-1232	µg/L	0.14	0.14	U	8/20/2012	
PCB-1232	µg/L	0.14	0.14	U	8/20/2012	Duplicate
PCB-1232	µg/L	0.14	0.14	UY	11/28/2012	
PCB-1242	µg/L	0.1	0.1	U	2/9/2012	
PCB-1242	µg/L	0.1	0.1	U	5/7/2012	
PCB-1242	µg/L	0.1	0.1	U	8/20/2012	
PCB-1242	µg/L	0.1	0.1	U	8/20/2012	Duplicate
PCB-1242	µg/L	0.1	0.1	UY	11/28/2012	
PCB-1248	µg/L	0.12	0.12	U	2/9/2012	
PCB-1248	µg/L	0.13	0.13	U	5/7/2012	
PCB-1248	µg/L	0.12	0.12	U	8/20/2012	Duplicate
PCB-1248	µg/L	0.12	0.12	U	8/20/2012	
PCB-1248	µg/L	0.12	0.12	UY	11/28/2012	
PCB-1254	µg/L	0.07	0.07	U	2/9/2012	
PCB-1254	µg/L	0.07	0.07	U	5/7/2012	
PCB-1254	µg/L	0.07	0.07	U	8/20/2012	Duplicate
PCB-1254	µg/L	0.07	0.07	U	8/20/2012	
PCB-1254	µg/L	0.07	0.07	UY	11/28/2012	
PCB-1260	µg/L	0.05	0.05	U	2/9/2012	
PCB-1260	µg/L	0.05	0.05	U	5/7/2012	
PCB-1260	µg/L	0.05	0.05	U	8/20/2012	Duplicate
PCB-1260	µg/L	0.05	0.05	U	8/20/2012	
PCB-1260	µg/L	0.05	0.05	UY	11/28/2012	
PCB-1268	µg/L	0.09	0.09	U	2/9/2012	
PCB-1268	µg/L	0.09	0.09	U	5/7/2012	
PCB-1268	µg/L	0.09	0.09	U	8/20/2012	Duplicate
PCB-1268	µg/L	0.09	0.09	U	8/20/2012	
PCB-1268	µg/L	0.09	0.09	UY	11/28/2012	
pH	Std Unit	7.58			2/9/2012	
pH	Std Unit	7.86			5/7/2012	
pH	Std Unit	7.27			8/20/2012	Duplicate
pH	Std Unit	7.27			8/20/2012	
pH	Std Unit	8.39			11/28/2012	
PCB, Total	µg/L	0.18	0.18	U	2/9/2012	
PCB, Total	µg/L	0.19	0.19	U	5/7/2012	
PCB, Total	µg/L	0.18	0.18	U	8/20/2012	
PCB, Total	µg/L	0.18	0.18	U	8/20/2012	Duplicate
PCB, Total	µg/L	0.17	0.17	UY	11/28/2012	
Temperature	deg F	54.5			2/9/2012	
Temperature	deg F	82.1			5/7/2012	
Temperature	deg F	81			8/20/2012	
Temperature	deg F	81			8/20/2012	Duplicate
Temperature	deg F	53.5			11/28/2012	
Trichloroethene	µg/L	1	1	U	2/9/2012	
Trichloroethene	µg/L	1	1	UJ	5/7/2012	

Surface Water Nonradiological Data

Table C.4.15. Nonradiological Monitoring Data for Surface Water Location L194 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
Trichloroethene	µg/L	1	1	UJY	8/20/2012	Duplicate
Trichloroethene	µg/L	1	1	UJY	8/20/2012	
Trichloroethene	µg/L	1	1	U	11/28/2012	

Table C.4.16. Nonradiological Monitoring Data for Surface Water Location L241

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
Alkalinity	mg/L	13			2/21/2012	
Alkalinity	mg/L	35			5/3/2012	
Alkalinity	mg/L	12			8/16/2012	
Alkalinity	mg/L	35			11/19/2012	
Conductivity	µmho/cm	293			2/21/2012	
Conductivity	µmho/cm	468			5/3/2012	
Conductivity	µmho/cm	388			8/16/2012	
Conductivity	µmho/cm	311			11/19/2012	
Dissolved Oxygen	mg/L	12.86			2/21/2012	
Dissolved Oxygen	mg/L	9.77			5/3/2012	
Dissolved Oxygen	mg/L	8.9			8/16/2012	
Dissolved Oxygen	mg/L	15.24			11/19/2012	
Flow Rate	mgd	2.33			2/21/2012	
Flow Rate	mgd	1.68			5/3/2012	
Flow Rate	mgd	3.1			8/16/2012	
Flow Rate	mgd	0.58			11/19/2012	
PCB-1016	µg/L	0.17	0.17	UY	2/21/2012	
PCB-1016	µg/L	0.17	0.17	U	5/3/2012	
PCB-1016	µg/L	0.17	0.17	U	8/16/2012	
PCB-1016	µg/L	0.17	0.17	U	11/19/2012	
PCB-1221	µg/L	0.18	0.18	UY	2/21/2012	
PCB-1221	µg/L	0.18	0.18	U	5/3/2012	
PCB-1221	µg/L	0.18	0.18	U	8/16/2012	
PCB-1221	µg/L	0.18	0.18	U	11/19/2012	
PCB-1232	µg/L	0.14	0.14	UY	2/21/2012	
PCB-1232	µg/L	0.14	0.14	U	5/3/2012	
PCB-1232	µg/L	0.14	0.14	U	8/16/2012	
PCB-1232	µg/L	0.14	0.14	U	11/19/2012	
PCB-1242	µg/L	0.1	0.1	UY	2/21/2012	
PCB-1242	µg/L	0.1	0.1	U	5/3/2012	
PCB-1242	µg/L	0.1	0.1	U	8/16/2012	
PCB-1242	µg/L	0.1	0.1	U	11/19/2012	
PCB-1248	µg/L	0.12	0.12	UY	2/21/2012	
PCB-1248	µg/L	0.12	0.12	U	5/3/2012	
PCB-1248	µg/L	0.12	0.12	U	8/16/2012	
PCB-1248	µg/L	0.12	0.12	U	11/19/2012	
PCB-1254	µg/L	0.07	0.07	UY	2/21/2012	
PCB-1254	µg/L	0.07	0.07	U	5/3/2012	
PCB-1254	µg/L	0.07	0.07	U	8/16/2012	
PCB-1254	µg/L	0.07	0.07	U	11/19/2012	

Surface Water Nonradiological Data

Table C.4.16. Nonradiological Monitoring Data for Surface Water Location L241 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
PCB-1260	µg/L	0.05	0.05	UY	2/21/2012
PCB-1260	µg/L	0.05	0.05	U	5/3/2012
PCB-1260	µg/L	0.05	0.05	U	8/16/2012
PCB-1260	µg/L	0.05	0.05	U	11/19/2012
PCB-1268	µg/L	0.09	0.09	UY	2/21/2012
PCB-1268	µg/L	0.09	0.09	U	5/3/2012
PCB-1268	µg/L	0.09	0.09	U	8/16/2012
PCB-1268	µg/L	0.09	0.09	U	11/19/2012
pH	Std Unit	8.07			2/21/2012
pH	Std Unit	7.83			5/3/2012
pH	Std Unit	7.32			8/16/2012
pH	Std Unit	8.36			11/19/2012
PCB, Total	µg/L	0.18	0.18	UY	2/21/2012
PCB, Total	µg/L	0.18	0.18	U	5/3/2012
PCB, Total	µg/L	0.18	0.18	U	8/16/2012
PCB, Total	µg/L	0.18	0.18	U	11/19/2012
Temperature	deg F	50			2/21/2012
Temperature	deg F	71.1			5/3/2012
Temperature	deg F	78.7			8/16/2012
Temperature	deg F	42.3			11/19/2012
Trichloroethene	µg/L	13	1	X	2/21/2012
Trichloroethene	µg/L	15	1	Y	5/3/2012
Trichloroethene	µg/L	1	1	UJY	8/16/2012
Trichloroethene	µg/L	1	1	UJ	11/19/2012

Table C.4.17. Nonradiological Monitoring Data for Surface Water Location L291

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
Alkalinity	mg/L	16			2/7/2012
Alkalinity	mg/L	25			5/2/2012
Alkalinity	mg/L	30			5/17/2012
Alkalinity	mg/L	30			8/13/2012
Alkalinity	mg/L	30			11/5/2012
Conductivity	µmho/cm	148			2/7/2012
Conductivity	µmho/cm	262			5/2/2012
Conductivity	µmho/cm	297			5/17/2012
Conductivity	µmho/cm	281			8/13/2012
Conductivity	µmho/cm	260			11/5/2012
Dissolved Oxygen	mg/L	13.35			2/7/2012
Dissolved Oxygen	mg/L	6.33			5/2/2012
Dissolved Oxygen	mg/L	7.91			5/17/2012
Dissolved Oxygen	mg/L	5.45			8/13/2012
Dissolved Oxygen	mg/L	15.73			11/5/2012
Flow Rate	mgd	3.04			2/7/2012
Flow Rate	mgd	0.3			5/2/2012
Flow Rate	mgd	0.17			5/17/2012
Flow Rate	mgd	0.54			8/13/2012

Surface Water Nonradiological Data

Table C.4.17. Nonradiological Monitoring Data for Surface Water Location L291 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
Flow Rate	mgd	0.06			11/5/2012
PCB-1016	µg/L	0.17	0.17	UX	2/7/2012
PCB-1016	µg/L	0.18	0.18	U	5/2/2012
PCB-1016	µg/L	0.16	0.16	U	8/13/2012
PCB-1016	µg/L	0.16	0.16	UX	11/5/2012
PCB-1221	µg/L	0.18	0.18	UX	2/7/2012
PCB-1221	µg/L	0.19	0.19	U	5/2/2012
PCB-1221	µg/L	0.17	0.17	U	8/13/2012
PCB-1221	µg/L	0.17	0.17	UX	11/5/2012
PCB-1232	µg/L	0.14	0.14	UX	2/7/2012
PCB-1232	µg/L	0.15	0.15	U	5/2/2012
PCB-1232	µg/L	0.14	0.14	U	8/13/2012
PCB-1232	µg/L	0.14	0.14	UX	11/5/2012
PCB-1242	µg/L	0.1	0.1	UX	2/7/2012
PCB-1242	µg/L	0.11	0.11	U	5/2/2012
PCB-1242	µg/L	0.1	0.1	U	8/13/2012
PCB-1242	µg/L	0.1	0.1	UX	11/5/2012
PCB-1248	µg/L	0.12	0.12	UX	2/7/2012
PCB-1248	µg/L	0.13	0.13	U	5/2/2012
PCB-1248	µg/L	0.12	0.12	U	8/13/2012
PCB-1248	µg/L	0.12	0.12	UX	11/5/2012
PCB-1254	µg/L	0.07	0.07	UX	2/7/2012
PCB-1254	µg/L	0.07	0.07	U	5/2/2012
PCB-1254	µg/L	0.07	0.07	U	8/13/2012
PCB-1254	µg/L	0.07	0.07	UX	11/5/2012
PCB-1260	µg/L	0.05	0.05	UXY	2/7/2012
PCB-1260	µg/L	0.05	0.05	U	5/2/2012
PCB-1260	µg/L	0.05	0.05	U	8/13/2012
PCB-1260	µg/L	0.05	0.05	UXJ	11/5/2012
PCB-1268	µg/L	0.09	0.09	UX	2/7/2012
PCB-1268	µg/L	0.1	0.1	U	5/2/2012
PCB-1268	µg/L	0.09	0.09	U	8/13/2012
PCB-1268	µg/L	0.09	0.09	UX	11/5/2012
pH	Std Unit	8.02			2/7/2012
pH	Std Unit	7.59			5/2/2012
pH	Std Unit	7.63			5/17/2012
pH	Std Unit	7.7			8/13/2012
pH	Std Unit	8.33			11/5/2012
PCB, Total	µg/L	0.18	0.18	UX	2/7/2012
PCB, Total	µg/L	0.19	0.19	U	5/2/2012
PCB, Total	µg/L	0.17	0.17	U	8/13/2012
PCB, Total	µg/L	0.17	0.17	UX	11/5/2012
Temperature	deg F	47.5			2/7/2012
Temperature	deg F	70.2			5/2/2012
Temperature	deg F	73.6			5/17/2012
Temperature	deg F	72.1			8/13/2012
Temperature	deg F	48.4			11/5/2012
Trichloroethene	µg/L	1	1	U	2/7/2012
Trichloroethene	µg/L	1	1	U	5/17/2012

Surface Water Nonradiological Data

Table C.4.17. Nonradiological Monitoring Data for Surface Water Location L291 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
Trichloroethene	µg/L	1	1	UJY	8/13/2012
Trichloroethene	µg/L	1	1	U	11/5/2012

Table C.4.18. Nonradiological Monitoring Data for Surface Water Location L306

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
Alkalinity	mg/L	23			2/8/2012
Alkalinity	mg/L	21			5/10/2012
Alkalinity	mg/L	14.5			8/29/2012
Alkalinity	mg/L	15			11/28/2012
Conductivity	µmho/cm	343			2/8/2012
Conductivity	µmho/cm	401			5/10/2012
Conductivity	µmho/cm	289			8/29/2012
Conductivity	µmho/cm	347			11/28/2012
Dissolved Oxygen	mg/L	29.08			2/8/2012
Dissolved Oxygen	mg/L	7.19			5/10/2012
Dissolved Oxygen	mg/L	7.88			8/29/2012
Dissolved Oxygen	mg/L	18.95			11/28/2012
PCB-1016	µg/L	0.17	0.17	U	2/8/2012
PCB-1016	µg/L	0.16	0.16	U	5/10/2012
PCB-1016	µg/L	0.17	0.17	U	8/29/2012
PCB-1016	µg/L	0.16	0.16	UY	11/28/2012
PCB-1221	µg/L	0.18	0.18	U	2/8/2012
PCB-1221	µg/L	0.17	0.17	U	5/10/2012
PCB-1221	µg/L	0.18	0.18	U	8/29/2012
PCB-1221	µg/L	0.17	0.17	UY	11/28/2012
PCB-1232	µg/L	0.14	0.14	U	2/8/2012
PCB-1232	µg/L	0.14	0.14	U	5/10/2012
PCB-1232	µg/L	0.14	0.14	U	8/29/2012
PCB-1232	µg/L	0.14	0.14	UY	11/28/2012
PCB-1242	µg/L	0.1	0.1	U	2/8/2012
PCB-1242	µg/L	0.1	0.1	U	5/10/2012
PCB-1242	µg/L	0.1	0.1	U	8/29/2012
PCB-1242	µg/L	0.1	0.1	UY	11/28/2012
PCB-1248	µg/L	0.12	0.12	U	2/8/2012
PCB-1248	µg/L	0.12	0.12	U	5/10/2012
PCB-1248	µg/L	0.12	0.12	U	8/29/2012
PCB-1248	µg/L	0.12	0.12	UY	11/28/2012
PCB-1254	µg/L	0.07	0.07	U	2/8/2012
PCB-1254	µg/L	0.07	0.07	U	5/10/2012
PCB-1254	µg/L	0.07	0.07	U	8/29/2012
PCB-1254	µg/L	0.07	0.07	UY	11/28/2012
PCB-1260	µg/L	0.05	0.05	U	2/8/2012
PCB-1260	µg/L	0.05	0.05	U	5/10/2012
PCB-1260	µg/L	0.05	0.05	U	8/29/2012
PCB-1260	µg/L	0.05	0.05	UY	11/28/2012
PCB-1268	µg/L	0.09	0.09	U	2/8/2012

Surface Water Nonradiological Data

Table C.4.18. Nonradiological Monitoring Data for Surface Water Location L306 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
PCB-1268	µg/L	0.09	0.09	U	5/10/2012
PCB-1268	µg/L	0.09	0.09	U	8/29/2012
PCB-1268	µg/L	0.09	0.09	UY	11/28/2012
pH	Std Unit	7.71			2/8/2012
pH	Std Unit	7.47			5/10/2012
pH	Std Unit	8.12			8/29/2012
pH	Std Unit	8.21			11/28/2012
PCB, Total	µg/L	0.18	0.18	U	2/8/2012
PCB, Total	µg/L	0.17	0.17	U	5/10/2012
PCB, Total	µg/L	0.18	0.18	U	8/29/2012
PCB, Total	µg/L	0.17	0.17	UY	11/28/2012
Temperature	deg F	47.4			2/8/2012
Temperature	deg F	72.7			5/10/2012
Temperature	deg F	82.8			8/29/2012
Temperature	deg F	51.4			11/28/2012
Trichloroethene	µg/L	1	1	U	2/8/2012
Trichloroethene	µg/L	1	1	U	5/10/2012
Trichloroethene	µg/L	1	1	UJY	8/29/2012
Trichloroethene	µg/L	1	1	U	11/28/2012

Table C.4.19. Nonradiological Monitoring Data for Surface Water Location S31

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
Alkalinity	mg/L	14			2/7/2012
Alkalinity	mg/L	20			5/2/2012
Alkalinity	mg/L	25			5/17/2012
Alkalinity	mg/L	30			8/13/2012
Alkalinity	mg/L	25			11/5/2012
Conductivity	µmho/cm	356			2/7/2012
Conductivity	µmho/cm	349			5/2/2012
Conductivity	µmho/cm	339			5/17/2012
Conductivity	µmho/cm	200			8/13/2012
Conductivity	µmho/cm	336			11/5/2012
Dissolved Oxygen	mg/L	9.12			2/7/2012
Dissolved Oxygen	mg/L	11.22			5/2/2012
Dissolved Oxygen	mg/L	10.96			5/17/2012
Dissolved Oxygen	mg/L	6.18			8/13/2012
Dissolved Oxygen	mg/L	6.74			11/5/2012
Flow Rate	mgd	1.3			2/7/2012
Flow Rate	mgd	0.6			5/2/2012
Flow Rate	mgd	0.8			5/17/2012
Flow Rate	mgd	2.3			8/13/2012
Flow Rate	mgd	0.7			11/5/2012
PCB-1016	µg/L	0.17	0.17	UX	2/7/2012
PCB-1016	µg/L	0.17	0.17	U	5/2/2012
PCB-1016	µg/L	0.17	0.17	U	8/13/2012
PCB-1016	µg/L	0.16	0.16	U	11/5/2012

Surface Water Nonradiological Data

Table C.4.19. Nonradiological Monitoring Data for Surface Water Location S31 (Continued)

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
PCB-1221	µg/L	0.18	0.18	UX	2/7/2012
PCB-1221	µg/L	0.18	0.18	U	5/2/2012
PCB-1221	µg/L	0.18	0.18	U	8/13/2012
PCB-1221	µg/L	0.17	0.17	U	11/5/2012
PCB-1232	µg/L	0.14	0.14	UX	2/7/2012
PCB-1232	µg/L	0.14	0.14	U	5/2/2012
PCB-1232	µg/L	0.14	0.14	U	8/13/2012
PCB-1232	µg/L	0.14	0.14	U	11/5/2012
PCB-1242	µg/L	0.1	0.1	UX	2/7/2012
PCB-1242	µg/L	0.1	0.1	U	5/2/2012
PCB-1242	µg/L	0.1	0.1	U	8/13/2012
PCB-1242	µg/L	0.1	0.1	U	11/5/2012
PCB-1248	µg/L	0.12	0.12	UX	2/7/2012
PCB-1248	µg/L	0.12	0.12	U	5/2/2012
PCB-1248	µg/L	0.12	0.12	U	8/13/2012
PCB-1248	µg/L	0.12	0.12	U	11/5/2012
PCB-1254	µg/L	0.07	0.07	UX	2/7/2012
PCB-1254	µg/L	0.07	0.07	U	5/2/2012
PCB-1254	µg/L	0.07	0.07	U	8/13/2012
PCB-1254	µg/L	0.07	0.07	U	11/5/2012
PCB-1260	µg/L	0.05	0.05	UXY	2/7/2012
PCB-1260	µg/L	0.05	0.05	U	5/2/2012
PCB-1260	µg/L	0.05	0.05	U	8/13/2012
PCB-1260	µg/L	0.05	0.05	UJ	11/5/2012
PCB-1268	µg/L	0.09	0.09	UX	2/7/2012
PCB-1268	µg/L	0.09	0.09	U	5/2/2012
PCB-1268	µg/L	0.09	0.09	U	8/13/2012
PCB-1268	µg/L	0.09	0.09	U	11/5/2012
pH	Std Unit	7.97			2/7/2012
pH	Std Unit	7.57			5/2/2012
pH	Std Unit	7.61			5/17/2012
pH	Std Unit	8.16			8/13/2012
pH	Std Unit	7.95			11/5/2012
PCB, Total	µg/L	0.18	0.18	UX	2/7/2012
PCB, Total	µg/L	0.18	0.18	U	5/2/2012
PCB, Total	µg/L	0.18	0.18	U	8/13/2012
PCB, Total	µg/L	0.17	0.17	U	11/5/2012
Temperature	deg F	60.1			2/7/2012
Temperature	deg F	78.7			5/2/2012
Temperature	deg F	77.6			5/17/2012
Temperature	deg F	79.3			8/13/2012
Temperature	deg F	67.3			11/5/2012
Trichloroethene	µg/L	1	1	U	2/7/2012
Trichloroethene	µg/L	1	1	U	5/17/2012
Trichloroethene	µg/L	1	1	UJY	8/13/2012
Trichloroethene	µg/L	1	1	U	11/5/2012

Surface Water Nonradiological Data

Table C.4.20. Nonradiological Monitoring Data for Surface Water Location LBCSP5

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
Alkalinity	mg/L	18			2/21/2012
Conductivity	µmho/cm	332			2/21/2012
Conductivity	µmho/cm	327			5/22/2012
Conductivity	µmho/cm	322			8/22/2012
Dissolved Oxygen	mg/L	3.62			2/21/2012
Dissolved Oxygen	mg/L	3.2			5/22/2012
Dissolved Oxygen	mg/L	3.05			8/22/2012
pH	Std Unit	7.49			2/21/2012
pH	Std Unit	6.25			5/22/2012
pH	Std Unit	6.65			8/22/2012
Temperature	deg F	58			2/21/2012
Temperature	deg F	58			5/22/2012
Temperature	deg F	64.9			8/22/2012
Trichloroethene	µg/L	78	1	X	2/21/2012
Trichloroethene	µg/L	100	1		5/22/2012
Trichloroethene	µg/L	51	1	JY	8/22/2012

Sediment Nonradiological Data

Table C.4.21. Nonradiological Monitoring Data for Sediment Location 746KTB2

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
PCB-1016	µg/kg	80	80	U	5/23/2012
PCB-1016	µg/kg	100	100	U	11/28/2012
PCB-1221	µg/kg	100	100	U	5/23/2012
PCB-1221	µg/kg	130	130	U	11/28/2012
PCB-1232	µg/kg	80	80	U	5/23/2012
PCB-1232	µg/kg	100	100	U	11/28/2012
PCB-1242	µg/kg	50	50	U	5/23/2012
PCB-1242	µg/kg	60	60	U	11/28/2012
PCB-1248	µg/kg	80	80	U	5/23/2012
PCB-1248	µg/kg	100	100	U	11/28/2012
PCB-1254	µg/kg	70	70	U	5/23/2012
PCB-1254	µg/kg	90	90	U	11/28/2012
PCB-1260	µg/kg	80	80	U	5/23/2012
PCB-1260	µg/kg	100	100	U	11/28/2012
PCB-1268	µg/kg	60	60	U	5/23/2012
PCB-1268	µg/kg	80	80	U	11/28/2012
PCB, Total	µg/kg	100	100	U	5/23/2012
PCB, Total	µg/kg	130	130	U	11/28/2012

Sediment Nonradiological Data

Table C.4.22. Nonradiological Monitoring Data for Sediment Location C612

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
PCB-1016	µg/kg	80	80	U	5/23/2012
PCB-1016	µg/kg	100	100	U	11/26/2012
PCB-1221	µg/kg	100	100	U	5/23/2012
PCB-1221	µg/kg	130	130	U	11/26/2012
PCB-1232	µg/kg	80	80	U	5/23/2012
PCB-1232	µg/kg	100	100	U	11/26/2012
PCB-1242	µg/kg	50	50	U	5/23/2012
PCB-1242	µg/kg	60	60	U	11/26/2012
PCB-1248	µg/kg	80	80	U	5/23/2012
PCB-1248	µg/kg	100	100	U	11/26/2012
PCB-1254	µg/kg	70	70	U	5/23/2012
PCB-1254	µg/kg	90	90	U	11/26/2012
PCB-1260	µg/kg	80	80	U	5/23/2012
PCB-1260	µg/kg	100	100	U	11/26/2012
PCB-1268	µg/kg	60	60	U	5/23/2012
PCB-1268	µg/kg	80	80	U	11/26/2012
PCB, Total	µg/kg	100	100	U	5/23/2012
PCB, Total	µg/kg	130	130	U	11/26/2012

Table C.4.23. Nonradiological Monitoring Data for Sediment Location C616

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
PCB-1016	µg/kg	80	80	U	5/23/2012
PCB-1016	µg/kg	100	100	U	11/26/2012
PCB-1221	µg/kg	100	100	U	5/23/2012
PCB-1221	µg/kg	130	130	U	11/26/2012
PCB-1232	µg/kg	80	80	U	5/23/2012
PCB-1232	µg/kg	100	100	U	11/26/2012
PCB-1242	µg/kg	50	50	U	5/23/2012
PCB-1242	µg/kg	60	60	U	11/26/2012
PCB-1248	µg/kg	80	80	U	5/23/2012
PCB-1248	µg/kg	100	100	U	11/26/2012
PCB-1254	µg/kg	70	70	U	5/23/2012
PCB-1254	µg/kg	90	90	U	11/26/2012
PCB-1260	µg/kg	80	80	U	5/23/2012
PCB-1260	µg/kg	100	100	U	11/26/2012
PCB-1268	µg/kg	60	60	U	5/23/2012
PCB-1268	µg/kg	80	80	U	11/26/2012
PCB, Total	µg/kg	100	100	U	5/23/2012
PCB, Total	µg/kg	130	130	U	11/26/2012

Sediment Nonradiological Data

Table C.4.24. Nonradiological Monitoring Data for Sediment Location K001

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
PCB-1016	µg/kg	80	80	U	5/23/2012
PCB-1016	µg/kg	100	100	U	11/26/2012
PCB-1221	µg/kg	100	100	U	5/23/2012
PCB-1221	µg/kg	130	130	U	11/26/2012
PCB-1232	µg/kg	80	80	U	5/23/2012
PCB-1232	µg/kg	100	100	U	11/26/2012
PCB-1242	µg/kg	50	50	U	5/23/2012
PCB-1242	µg/kg	60	60	U	11/26/2012
PCB-1248	µg/kg	80	80	U	5/23/2012
PCB-1248	µg/kg	100	100	U	11/26/2012
PCB-1254	µg/kg	70	70	U	5/23/2012
PCB-1254	µg/kg	90	90	U	11/26/2012
PCB-1260	µg/kg	80	80	U	5/23/2012
PCB-1260	µg/kg	100	100	U	11/26/2012
PCB-1268	µg/kg	60	60	U	5/23/2012
PCB-1268	µg/kg	80	80	U	11/26/2012
PCB, Total	µg/kg	100	100	U	5/23/2012
PCB, Total	µg/kg	130	130	U	11/26/2012

Table C.4.25. Nonradiological Monitoring Data for Sediment Location L194

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
PCB-1016	µg/kg	80	80	U	5/23/2012
PCB-1016	µg/kg	100	100	U	11/28/2012
PCB-1221	µg/kg	100	100	U	5/23/2012
PCB-1221	µg/kg	130	130	U	11/28/2012
PCB-1232	µg/kg	80	80	U	5/23/2012
PCB-1232	µg/kg	100	100	U	11/28/2012
PCB-1242	µg/kg	50	50	U	5/23/2012
PCB-1242	µg/kg	60	60	U	11/28/2012
PCB-1248	µg/kg	80	80	U	5/23/2012
PCB-1248	µg/kg	100	100	U	11/28/2012
PCB-1254	µg/kg	70	70	U	5/23/2012
PCB-1254	µg/kg	90	90	U	11/28/2012
PCB-1260	µg/kg	80	80	U	5/23/2012
PCB-1260	µg/kg	100	100	U	11/28/2012
PCB-1268	µg/kg	60	60	U	5/23/2012
PCB-1268	µg/kg	80	80	U	11/28/2012
PCB, Total	µg/kg	100	100	U	5/23/2012
PCB, Total	µg/kg	130	130	U	11/28/2012

Sediment Nonradiological Data

Table C.4.26. Nonradiological Monitoring Data for Sediment Location S1

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
PCB-1016	µg/kg	80	80	U	5/23/2012
PCB-1016	µg/kg	100	100	U	11/28/2012
PCB-1221	µg/kg	100	100	U	5/23/2012
PCB-1221	µg/kg	130	130	U	11/28/2012
PCB-1232	µg/kg	80	80	U	5/23/2012
PCB-1232	µg/kg	100	100	U	11/28/2012
PCB-1242	µg/kg	50	50	U	5/23/2012
PCB-1242	µg/kg	60	60	U	11/28/2012
PCB-1248	µg/kg	80	80	U	5/23/2012
PCB-1248	µg/kg	100	100	U	11/28/2012
PCB-1254	µg/kg	70	70	U	5/23/2012
PCB-1254	µg/kg	90	90	U	11/28/2012
PCB-1260	µg/kg	80	80	U	5/23/2012
PCB-1260	µg/kg	100	100	U	11/28/2012
PCB-1268	µg/kg	60	60	U	5/23/2012
PCB-1268	µg/kg	80	80	U	11/28/2012
PCB, Total	µg/kg	100	100	U	5/23/2012
PCB, Total	µg/kg	130	130	U	11/28/2012

Table C.4.27. Nonradiological Monitoring Data for Sediment Location S2

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
PCB-1016	µg/kg	80	80	U	5/23/2012
PCB-1016	µg/kg	100	100	U	11/28/2012
PCB-1221	µg/kg	100	100	U	5/23/2012
PCB-1221	µg/kg	130	130	U	11/28/2012
PCB-1232	µg/kg	80	80	U	5/23/2012
PCB-1232	µg/kg	100	100	U	11/28/2012
PCB-1242	µg/kg	50	50	U	5/23/2012
PCB-1242	µg/kg	60	60	U	11/28/2012
PCB-1248	µg/kg	80	80	U	5/23/2012
PCB-1248	µg/kg	100	100	U	11/28/2012
PCB-1254	µg/kg	70	70	U	5/23/2012
PCB-1254	µg/kg	90	90	U	11/28/2012
PCB-1260	µg/kg	80	80	U	5/23/2012
PCB-1260	µg/kg	100	100	U	11/28/2012
PCB-1268	µg/kg	60	60	U	5/23/2012
PCB-1268	µg/kg	80	80	U	11/28/2012
PCB, Total	µg/kg	100	100	U	5/23/2012
PCB, Total	µg/kg	130	130	U	11/28/2012

Sediment Nonradiological Data

Table C.4.28. Nonradiological Monitoring Data for Sediment Location S20

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
PCB-1016	µg/kg	80	80	U	5/23/2012
PCB-1016	µg/kg	100	100	U	11/28/2012
PCB-1221	µg/kg	100	100	U	5/23/2012
PCB-1221	µg/kg	130	130	U	11/28/2012
PCB-1232	µg/kg	80	80	U	5/23/2012
PCB-1232	µg/kg	100	100	U	11/28/2012
PCB-1242	µg/kg	50	50	U	5/23/2012
PCB-1242	µg/kg	60	60	U	11/28/2012
PCB-1248	µg/kg	80	80	U	5/23/2012
PCB-1248	µg/kg	100	100	U	11/28/2012
PCB-1254	µg/kg	70	70	U	5/23/2012
PCB-1254	µg/kg	90	90	U	11/28/2012
PCB-1260	µg/kg	80	80	U	5/23/2012
PCB-1260	µg/kg	100	100	U	11/28/2012
PCB-1268	µg/kg	60	60	U	5/23/2012
PCB-1268	µg/kg	80	80	U	11/28/2012
PCB, Total	µg/kg	100	100	U	5/23/2012
PCB, Total	µg/kg	130	130	U	11/28/2012

Table C.4.29. Nonradiological Monitoring Data for Sediment Location S27

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
PCB-1016	µg/kg	80	80	U	5/23/2012	Duplicate
PCB-1016	µg/kg	80	80	U	5/23/2012	
PCB-1016	µg/kg	100	100	U	11/28/2012	
PCB-1221	µg/kg	100	100	U	5/23/2012	
PCB-1221	µg/kg	100	100	U	5/23/2012	Duplicate
PCB-1221	µg/kg	130	130	U	11/28/2012	
PCB-1232	µg/kg	80	80	U	5/23/2012	
PCB-1232	µg/kg	80	80	U	5/23/2012	Duplicate
PCB-1232	µg/kg	100	100	U	11/28/2012	
PCB-1242	µg/kg	50	50	U	5/23/2012	Duplicate
PCB-1242	µg/kg	50	50	U	5/23/2012	
PCB-1242	µg/kg	60	60	U	11/28/2012	
PCB-1248	µg/kg	80	80	U	5/23/2012	
PCB-1248	µg/kg	80	80	U	5/23/2012	Duplicate
PCB-1248	µg/kg	100	100	U	11/28/2012	
PCB-1254	µg/kg	70	70	U	5/23/2012	
PCB-1254	µg/kg	70	70	U	5/23/2012	Duplicate
PCB-1254	µg/kg	90	90	U	11/28/2012	
PCB-1260	µg/kg	80	80	U	5/23/2012	
PCB-1260	µg/kg	80	80	U	5/23/2012	Duplicate
PCB-1260	µg/kg	100	100	U	11/28/2012	
PCB-1268	µg/kg	60	60	U	5/23/2012	
PCB-1268	µg/kg	60	60	U	5/23/2012	Duplicate
PCB-1268	µg/kg	80	80	U	11/28/2012	
PCB, Total	µg/kg	100	100	U	5/23/2012	
PCB, Total	µg/kg	100	100	U	5/23/2012	Duplicate
PCB, Total	µg/kg	130	130	U	11/28/2012	

Sediment Nonradiological Data

Table C.4.30. Nonradiological Monitoring Data for Sediment Location S28

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
PCB-1016	µg/kg	80	80	U	5/23/2012
PCB-1016	µg/kg	100	100	U	11/28/2012
PCB-1221	µg/kg	100	100	U	5/23/2012
PCB-1221	µg/kg	130	130	U	11/28/2012
PCB-1232	µg/kg	80	80	U	5/23/2012
PCB-1232	µg/kg	100	100	U	11/28/2012
PCB-1242	µg/kg	50	50	U	5/23/2012
PCB-1242	µg/kg	60	60	U	11/28/2012
PCB-1248	µg/kg	80	80	U	5/23/2012
PCB-1248	µg/kg	100	100	U	11/28/2012
PCB-1254	µg/kg	70	70	U	5/23/2012
PCB-1254	µg/kg	90	90	U	11/28/2012
PCB-1260	µg/kg	80	80	U	5/23/2012
PCB-1260	µg/kg	100	100	U	11/28/2012
PCB-1268	µg/kg	60	60	U	5/23/2012
PCB-1268	µg/kg	80	80	U	11/28/2012
PCB, Total	µg/kg	100	100	U	5/23/2012
PCB, Total	µg/kg	130	130	U	11/28/2012

Table C.4.31. Nonradiological Monitoring Data for Sediment Location S31

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
PCB-1016	µg/kg	80	80	U	5/23/2012
PCB-1016	µg/kg	100	100	U	11/26/2012
PCB-1221	µg/kg	100	100	U	5/23/2012
PCB-1221	µg/kg	130	130	U	11/26/2012
PCB-1232	µg/kg	80	80	U	5/23/2012
PCB-1232	µg/kg	100	100	U	11/26/2012
PCB-1242	µg/kg	50	50	U	5/23/2012
PCB-1242	µg/kg	60	60	U	11/26/2012
PCB-1248	µg/kg	80	80	U	5/23/2012
PCB-1248	µg/kg	100	100	U	11/26/2012
PCB-1254	µg/kg	70	70	U	5/23/2012
PCB-1254	µg/kg	90	90	U	11/26/2012
PCB-1260	µg/kg	80	80	U	5/23/2012
PCB-1260	µg/kg	230	100		11/26/2012
PCB-1268	µg/kg	60	60	U	5/23/2012
PCB-1268	µg/kg	80	80	U	11/26/2012
PCB, Total	µg/kg	100	100	U	5/23/2012
PCB, Total	µg/kg	230	130		11/26/2012

Sediment Nonradiological Data

Table C.4.32. Nonradiological Monitoring Data for Sediment Location S32

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
PCB-1016	µg/kg	80	80	U	5/23/2012
PCB-1016	µg/kg	80	80	U	12/27/2012
PCB-1221	µg/kg	100	100	U	5/23/2012
PCB-1221	µg/kg	100	100	U	12/27/2012
PCB-1232	µg/kg	80	80	U	5/23/2012
PCB-1232	µg/kg	80	80	U	12/27/2012
PCB-1242	µg/kg	50	50	U	5/23/2012
PCB-1242	µg/kg	50	50	U	12/27/2012
PCB-1248	µg/kg	80	80	U	5/23/2012
PCB-1248	µg/kg	80	80	U	12/27/2012
PCB-1254	µg/kg	70	70	U	5/23/2012
PCB-1254	µg/kg	70	70	U	12/27/2012
PCB-1260	µg/kg	80	80	U	5/23/2012
PCB-1260	µg/kg	130	80		12/27/2012
PCB-1268	µg/kg	60	60	U	5/23/2012
PCB-1268	µg/kg	60	60	U	12/27/2012
PCB, Total	µg/kg	100	100	U	5/23/2012
PCB, Total	µg/kg	130	100		12/27/2012

Sediment Nonradiological Data

Table C.4.33. Nonradiological Monitoring Data for Sediment Location S33

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected	
PCB-1016	µg/kg	80	80	U	5/23/2012	
PCB-1016	µg/kg	100	100	U	11/28/2012	
PCB-1016	µg/kg	100	100	U	11/28/2012	Duplicate
PCB-1221	µg/kg	100	100	U	5/23/2012	
PCB-1221	µg/kg	120	120	U	11/28/2012	
PCB-1221	µg/kg	120	120	U	11/28/2012	Duplicate
PCB-1232	µg/kg	80	80	U	5/23/2012	
PCB-1232	µg/kg	100	100	U	11/28/2012	
PCB-1232	µg/kg	100	100	U	11/28/2012	Duplicate
PCB-1242	µg/kg	50	50	U	5/23/2012	
PCB-1242	µg/kg	60	60	U	11/28/2012	
PCB-1242	µg/kg	60	60	U	11/28/2012	Duplicate
PCB-1248	µg/kg	80	80	U	5/23/2012	
PCB-1248	µg/kg	100	100	U	11/28/2012	Duplicate
PCB-1248	µg/kg	100	100	U	11/28/2012	
PCB-1254	µg/kg	70	70	U	5/23/2012	
PCB-1254	µg/kg	90	90	U	11/28/2012	Duplicate
PCB-1254	µg/kg	90	90	U	11/28/2012	
PCB-1260	µg/kg	80	80	U	5/23/2012	
PCB-1260	µg/kg	100	100	U	11/28/2012	Duplicate
PCB-1260	µg/kg	100	100	U	11/28/2012	
PCB-1268	µg/kg	60	60	U	5/23/2012	
PCB-1268	µg/kg	80	80	U	11/28/2012	
PCB-1268	µg/kg	80	80	U	11/28/2012	Duplicate
PCB, Total	µg/kg	100	100	U	5/23/2012	
PCB, Total	µg/kg	120	120	U	11/28/2012	
PCB, Total	µg/kg	120	120	U	11/28/2012	Duplicate

Sediment Nonradiological Data

Table C.4.34. Nonradiological Monitoring Data for Sediment Location S34

Analysis	Units	Result	Reporting Limit	Lab Qualifiers	Date Collected
PCB-1016	µg/kg	80	80	U	5/23/2012
PCB-1016	µg/kg	100	100	U	11/28/2012
PCB-1221	µg/kg	100	100	U	5/23/2012
PCB-1221	µg/kg	120	120	U	11/28/2012
PCB-1232	µg/kg	80	80	U	5/23/2012
PCB-1232	µg/kg	100	100	U	11/28/2012
PCB-1242	µg/kg	50	50	U	5/23/2012
PCB-1242	µg/kg	60	60	U	11/28/2012
PCB-1248	µg/kg	80	80	U	5/23/2012
PCB-1248	µg/kg	100	100	U	11/28/2012
PCB-1254	µg/kg	70	70	U	5/23/2012
PCB-1254	µg/kg	90	90	U	11/28/2012
PCB-1260	µg/kg	80	80	U	5/23/2012
PCB-1260	µg/kg	100	100	U	11/28/2012
PCB-1268	µg/kg	60	60	U	5/23/2012
PCB-1268	µg/kg	80	80	U	11/28/2012
PCB, Total	µg/kg	100	100	U	5/23/2012
PCB, Total	µg/kg	120	120	U	11/28/2012

Units of Radiation Measure

Current System	System International	Conversion
curie (Ci)	becquerel (Bq)	1 Ci = 3.7 x 10^{10} Bq
rad (radiation absorbed dose)	gray (Gy)	1 rad = 0.01 Gy
rem (roentgen equivalent man)	sievert (Sv)	1 rem = 0.01 Sv

Conversions

Multiply	*by*	*to obtain*	*Multiply*	*by*	*to obtain*
inch	2.54	cm	cm	0.394	inch
ft	0.305	m	m	3.28	ft
mi	1.61	km	km	0.621	mi
lb	0.454	kg	kg	2.205	lb
gal	3.78	L	L	0.264	gal
ft^2	0.0929	m^2	m^2	10.8	ft^2
mi^2	2.59	km^2	km^2	0.386	mi^2
ft^3	0.0283	m^3	m^3	35.3	ft^3
acres	0.405	ha	ha	2.47	acres
dpm	0.45	pCi	pCi	2.22	dpm
pCi	10^{-6}	µCi	µCi	10^{6}	pCi
pCi/L (water)	10^{-9}	µCi/mL (water)	µCi/mL (water)	10^{9}	pCi/L (water)
pCi/m^3 (air)	10^{-12}	µCi/mL (air)	µCi/mL (air)	10^{12}	pCi/m^3 (air)

ha = hectares

Paducah Site

Annual Site Environmental Report for Calendar Year 2012